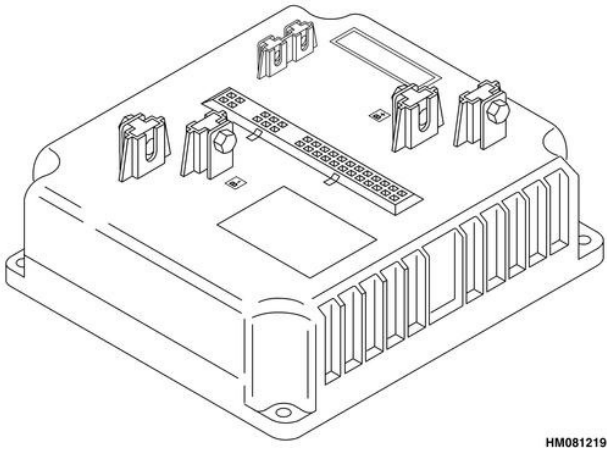
CURTIS 1297 TRANSISTOR MOTOR CONTROLLER

MPE080-E [A890]; MPW080-E [A891]; MPW065-E [A894]; MPE060-E [A896]; MPW060-E [A897]; MTR005-E [A902]; MTR007-E [A903]; MPC060-E [A904]; MPC080-E [A905]



HM081219

SAFETY PRECAUTIONS MAINTENANCE AND REPAIR

- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **YALE APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

NOTE: The following symbols and words indicate safety information in this manual:

WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the WARNING symbol and word are on orange background. The CAUTION symbol and word are on yellow background.

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This section is for the following models:

MPE080-E [A890];
MPW080-E [A891];
MPW065-E [A894];
MPE060-E [A896];
MPW060-E [A897];
MTR005-E [A902];
MTR007-E [A903];
MPC060-E [A904];
MPC080-E [A905]

General

This section describes the Curtis 1297 Transistor Motor Controller. Procedures are outlined for controller programming and troubleshooting.

SAFETY PRECAUTIONS

WARNING
Disconnect the battery and separate the connectors before opening the compartment cover or inspecting or repairing the electrical system. If a tool causes a short circuit, the high current

flow from the battery can cause personal injury or property damage.

All checks, adjustments, and repairs in the drive unit compartment are done with the compartment cover removed. Remove the drive unit compartment cover for access to the electrical components.

WARNING

The capacitor in the transistor controller can hold an electrical charge after the battery has been disconnected. To prevent electrical shock and personal injury, discharge the capacitor before inspection or repairing any component in the drive unit compartment. Wear safety glasses. Make certain the battery has been disconnected. DO NOT use a screwdriver to discharge the traction motor controller.

CAUTION

To avoid controller damage, always disconnect the battery before disconnecting any cables from the controller. Discharge the capacitor, and never put power to the controller with any power wire disconnected. Never short any controller terminal or motor terminal to the battery. Make sure to use proper procedure when servicing the controller.

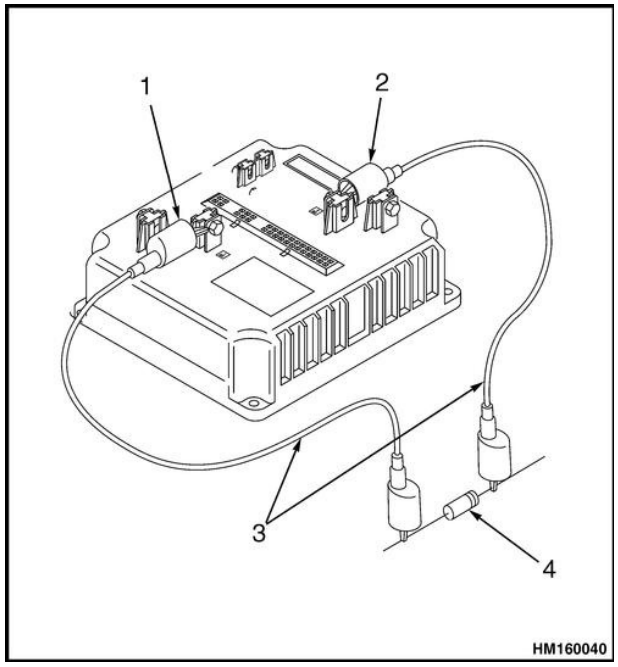
The following steps must be followed to discharge the capacitors **before** any checks or repairs are performed on the controller or any part of the electrical system.

1. Block the wheels so that the truck will not roll or block the truck so that the wheels are off the floor. See How to Put Lift Truck on Blocks.

2. Turn the key switch to the **OFF** position and disconnect the battery.

3. Discharge the capacitors in the controller by connecting a 200-ohm, 2-watt resistor across the controller's B+ and B– terminals using two insulated jumper wires. See Figure 1.

NOTE: DO NOT use any other method of discharging the capacitors. Remove the 200-ohm, 2-watt resistor before reconnecting the battery.



1. POSITIVE CONNECTION
2. NEGATIVE CONNECTION
3. JUMPER WIRES
4. 200-OHM, 2-WATT RESISTOR

Figure 1. Discharging the Capacitors

Description

CURTIS PMC 1297 TRANSISTOR MOTOR CONTROLLER

The Curtis controller is a solid state DC motor controller utilizing SEM technology. It can control the traction motor, brake, and hydraulic system. The controller receives inputs from the control handle by serial communication, and direct inputs from other switches depending on model. These may include the following:

- Key switch
- Control handle arm position switch
- High-speed switch

The controller directly controls the traction motor, lift pump motor, main contactor, and the brake (on some models). The motor controller controls the speed of the traction motor and the hydraulic lift pump motor operation. The controller software provides self diagnostics which are accessed by means of a Curtis handset.

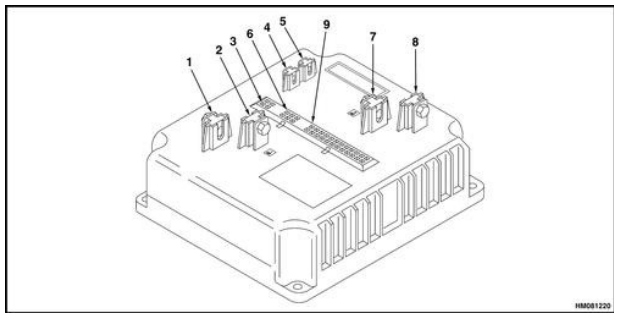
PRINCIPLES OF OPERATION

The Curtis 1297 SEM Traction Motor Controller uses a sophisticated microprocessor to control the logic and operation of the controller, eliminating the need for forward and reverse contactors. The SEM motor controller operates on the principle of controlling the motor field circuit and the motor armature circuit independently. The controller has many programmable features, including maximum speed, acceleration rate, neutral braking, and braking current limit. The SEM controller includes a full range of features as well as diagnostic and setup capability for reliable operation.

NOTE: There are no user-serviceable parts in the Curtis 1297 controller. No attempt should be made to open, repair, or otherwise modify the controller. Doing so may damage the controller and will void the warranty.

INSTALL

1. Make certain the mounting surface for the traction motor controller is clean. There should be no dirt between the contactor panel mounting plate and the traction motor controller.
2. Connect wires and cables to controller terminals. See Figure 2. Plug J1 connector into J1 receptacle, and plug J2 connector into J2 receptacle of the traction motor controller.



1. PUMP MOTOR TERMINAL
2. B+ POWER TERMINAL
3. J3 CONNECTOR
4. F2 TERMINAL
5. F1 TERMINAL
6. J2 CONNECTOR
7. B– POWER TERMINAL
8. TRACTION
9. J1 CONNECTOR

Figure 2. Controller With (Control) and Cable (Power) Terminals

3. Refer to Programming Controller for setup of the controller.

The motor controller controls the speed of the traction motor and the hydraulic pump motor operation. The complete unit must be replaced if correct troubleshooting methods show that the unit is damaged.

PROGRAMMING CONTROLLER

The Curtis 1297 controller can be programmed using a Curtis 1307 or 1311 handset. The areas that can be programmed are listed in Table 1 or Table 3 along with the adjustable ranges.

Table 1. Program Menu 1

Controller Parameters	Units	MPE 060 E	MPW 060 E	MPW 065 E	Adjustable Range	Description
M1 Brake Current Limit	Amps	250	220	300	50 to 350	Mode 1 Braking Current Limit
M2 Brake Current Limit	Amps	250	-	-	50 to 350	Mode 2 Braking Current Limit
M1 Acceleration Rate	Sec	0.3	0.3	0.3	0.1 to 3.0	Mode 1 Acceleration Rate
M2 Acceleration Rate	Sec	0.1	-	-	0.1 to 3.0	Mode 2 Acceleration Rate
M1 Deceleration Limit	Sec	10.0	2.1	2.1	0.1 to 10.0	Mode 1 Deceleration Rate
M2 Deceleration Limit	Sec	10.0	-	-	0.1 to 10.0	Mode 2 Deceleration Rate
M1 Max Speed Limit	%	48	82	100	25 to 82	Mode 1 Max Speed, as % armature PWM
M2 Max Speed Limit	%	100	-	-	26 to 100	Mode 2 Max Speed, as % armature PWM
Coast Current Limit	Amps	9	25	-	0 to 350	Coast Mode Deceleration Rate
Restraint	Amps	5.4	9.0	11.0	Min. Field to 40.0	
BDI Empty Volts	VPC (Volts Per Cell × 100)	167	167	167	90 to Full	Battery VPC at 0% State of Charge

Table 2. Program Menu 1

Controller Parameters	Units	MPE 080 E	MPE 080 (EE)	MPW 080 E	Adjustable Range	Description
M1 Brake Current Limit	Amps	300	300	220	50 to 350	Mode 1 Braking Current Limit
M2 Brake Current Limit	Amps	300	300	220	50 to 350	Mode 2 Braking Current Limit
M1 Acceleration Rate	Sec	0.3	0.3	0.3	0.1 to 3.0	Mode 1 Acceleration Rate
M2 Acceleration Rate	Sec	0.1	1.0	-	0.1 to 3.0	Mode 2 Acceleration Rate
M1 Deceleration Limit	Sec	10.0	10.0	2.1	0.1 to 10.0	Mode 1 Deceleration Rate

M2 Deceleration Limit	Sec	10.0	10.0	-	0.1 to 10.0	Mode 2 Deceleration Rate
M1 Max Speed Limit	%	48	48	82	25 to 82	Mode 1 Max Speed, as % armature PWM
M2 Max Speed Limit	%	100	100	-	26 to 100	Mode 2 Max Speed, as % armature PWM
Coast Current Limit	Amps	0	0	25	0 to 350	Coast Mode Deceleration Rate
Restraint	Amps	9.2	6.0	9.0	Min. Field to 40.0	
BDI Empty Volts	VPC (Volts Per Cell × 100)	167	167	167	90 to Full	Battery VPC at 0% State of Charge

Table 3. Program Menu 2

Controller Parameters	Units	MPC060 E	MPC080 E	Adjustable Range	Description
M1 Brake Current Limit	Amps	250	300	75 to 350	Mode 1 Braking Current Limit
M2 Brake Current Limit	Amps	250	300	75 to 350	Mode 2 Braking Current Limit
M1 Acceleration Rate	Sec	0.3	0.3	0.1 to 3.0	Mode 1 Acceleration Rate
M2 Acceleration Rate	Sec	0.1	0.1	0.1 to 3.0	Mode 2 Acceleration Rate
M1 Deceleration Limit	Sec	10.0	10.0	0.1 to 10.0	Mode 1 Deceleration Rate
M2 Deceleration Limit	Sec	10.0	6.1	0.1 to 10.0	Mode 2 Deceleration Rate
M1 Max Speed Limit	%	36	36	25 to 100	Mode 1 Max Speed, as % armature PWM
M2 Max Speed Limit	%	100	100	25 to 100	Mode 2 Max Speed, as % armature PWM
Coast Current Limit	Amps	25	25	25 to 350	Coast Mode Deceleration Rate
Restraint	Amps	5.4	4.4	Min. Field to 40.0	
BDI Empty Volts	VPC (Volts Per Cell × 100)	167	167	90 to Full	Battery VPC at 0% State of Charge

Table 4. Program Menu 2

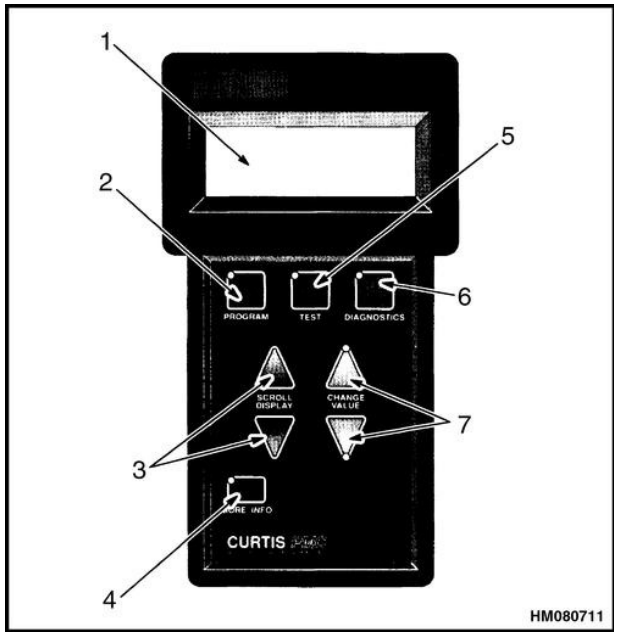
Controller Parameters	Units	MTR005 E	MTR007 E	MTR007 (EE)	Adjustable Range	Description
M1 Brake Current Limit	Amps	250	300	300	75 to 350	Mode 1 Braking Current Limit
M2 Brake Current Limit	Amps	250	300	300	75 to 350	Mode 2 Braking Current Limit
M1 Acceleration Rate	Sec	0.3	0.3	0.3	0.1 to 3.0	Mode 1 Acceleration Rate
M2 Acceleration Rate	Sec	0.1	1.0	1.0	0.1 to 3.0	Mode 2 Acceleration Rate
M1 Deceleration Limit	Sec	10.0	10.0	10.0	0.1 to 10.0	Mode 1 Deceleration Rate
M2 Deceleration Limit	Sec	10.0	6.1	6.1	0.1 to 10.0	Mode 2 Deceleration Rate
M1 Max Speed Limit	%	36	36	48	25 to 100	Mode 1 Max Speed, as % armature PWM
M2 Max Speed Limit	%	100	100	100	25 to 100	Mode 2 Max Speed, as % armature PWM
Coast Current Limit	Amps	25	25	25	25 to 350	Coast Mode Deceleration Rate
Restraint	Amps	5.4	4.4	6.0	Min. Field to 40.0	
BDI Empty Volts	VPC (Volts Per Cell × 100)	167	167	167	90 to Full	Battery VPC at 0% State of Charge

1307 Programmer Handset

DESCRIPTION/FEATURES

The programmer handset is a handheld tool that allows the user to program, test, and diagnose the traction motor controller. See Figure 3. It has been designed for ease of use with eight keys to control all functions. A MORE INFO key is included to provide more detail on any display item.

The display window contains a four-line LCD display. This display is visible in most lighting conditions. When the programmer is in the *PROGRAM*, *TEST*, or *DIAGNOSTICS* mode, 4 lines of a menu are displayed. The item at the top of the display window is the selected item (in the *PROGRAM* menu, the selected item will be highlighted with a flashing arrow).



1. 4-LINE LCD DISPLAY WINDOW
2. SELECTS PROGRAM MENU
3. SCROLLS DISPLAY UP AND DOWN
4. SELECTS MORE INFO, SPECIAL PROGRAM, AND DIAGNOSTIC MENUS
5. SELECTS TEST MENU
6. SELECTS DIAGNOSTICS MENU
7. CHANGES VALUE OF SELECTED ITEM

Figure 3. Curtis 1307 Programmer Handset

SCROLL DISPLAY KEYS

To scroll up and down within a menu, use the 2 *scroll display* arrow keys. The *scroll display* arrow keys can be pressed repeatedly or held down. When a key is held down, the scrolling speed increases the longer the key is held.

To the left of the *PROGRAM*, *TEST*, and *DIAGNOSTICS* menu, a small scroll bar is displayed. The scroll bar gives a rough indication of the position of the four displayed items within the entire menu. That is, when the scroll bar is at the top of the window, the top of the menu is displayed. When scrolling through the menu, the bar will move downward. When the bar is at the bottom, the end of the menu has been reached.

CHANGE VALUE KEYS

The *change value* arrow keys increase or decrease the value of the selected menu item. There is an LED on each arrow key to indicate when the key is active and a change is permissible. When the LED is off, the limit setting (maximum or minimum) of the function has been reached.

The *change value* keys may be pressed repeatedly or held in the same manner as the *scroll display* keys. The longer the key is held the faster the value changes. This allows rapid changing of any function value.

MORE INFO KEY

The *more info* key is used to display additional information about the selected item and to access the *SPECIAL PROGRAM* menu and the *DIAGNOSTICS HISTORY* menu. When the programmer is in any of the operating modes, the *more info* key may be pressed to display additional information about the selected item. Press the *more info* key again to return to the original list. In the *PROGRAM* menu, a bar graph is displayed along with the minimum and maximum values available for the selected item. If the minimum or maximum value has been programmed, a message replaces the bar graph, and any dependencies are listed.

Operation

CONNECTING HANDSET TO TRACTION MOTOR CONTROLLER

NOTE: Each time the programmer handset is connected to the controller, it acquires all of the controller function value settings and stores them in its temporary memory. This allows the user to revert back to the original settings at any time. The *SPECIAL PROGRAM* menu selection *RESET ALL SETTINGS* is used to revert to the original settings. Any unwanted change made to any of the function values can be "undone" in this manner, as long as the programmer has not been unplugged or the key switch has not been turned to the **OFF** position (power disconnected).

1. Turn the key switch to the **OFF** position.

2. Disconnect and separate battery connector.

3. Remove drive unit compartment cover.

WARNING

The capacitor in the traction motor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and injury, discharge the capacitor before inspecting or repairing any component. Wear safety glasses. Make certain the battery has been disconnected. DO NOT use a screwdriver to discharge the traction motor controller.

NOTE: The programmer handset should only be connected and disconnected with the key switch in the **OFF** position.

4. Discharge the capacitors in the controller. See Safety Precautions.

5. Connect the programmer handset to J3 connector on the traction motor controller.

6. Reconnect the battery.

7. Turn the key switch to the **ON** position.

DISCONNECTING HANDSET FROM TRACTION MOTOR CONTROLLER

1. Turn the key switch to the **OFF** position.

2. Disconnect and separate battery connector.

WARNING

The capacitor in the traction motor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and injury, discharge the capacitor before inspecting or repairing any component. Wear safety glasses. Make certain the battery has been disconnected.

3. Discharge capacitors in traction motor controller by connecting a load (such as a contactor coil or a horn) across the controller's B+ and B– terminals. See Figure 5.

4. Discharge the capacitors in the controller. See Safety Precautions.

5. Disconnect programmer handset from J3 connector on traction motor controller.

NOTE: The programmer handset should only be connected and disconnected with the key switch in the **OFF** position.

6. Install drive unit compartment cover.

7. Reconnect battery.

PROGRAMMER SELF-TEST

You can test the programmer by displaying two special test screens. See Figure 4. Press and hold the *more info* key while the programmer is powering up. During the self-test, you can toggle between the two test screens by pressing the *scroll display* keys. The first screen turns on every LCD element, and the second screen displays all the characters used in the various menus. As part of the self-test, you can also test the keys by pressing each one and observing whether its corner LED lights up. To exit the self-test, turn the key switch to the **OFF** position and then unplug the programmer.

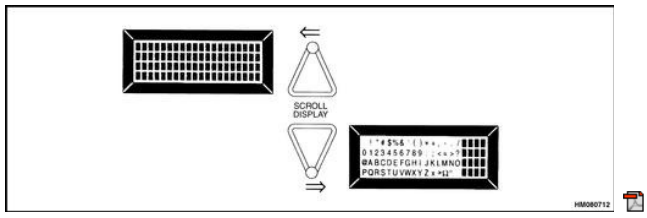


Figure 4. Programmer Handset Self-Test

MENU SELECTIONS

Program Menu

Press the *program* key to enter the *PROGRAM* mode. The LED in the corner of the *program* key illuminates to indicate that the programmer has been placed in the *PROGRAM* mode. The adjustable functions are shown in the display window, 4 at a time, with the corresponding settings. The setting of the selected item (the item at the top of the display with the flashing arrow) can be changed using the *change value* keys. The *change value* keys have LEDs to indicate whether the key can be used to increase or decrease the value any further.

Press the *more info* key to display more detailed information for the setting selected, including a bar graph indicating the position of the current setting relative to the range for the setting, the unit of measure, and the specific minimum and maximum values for the setting. If the range is limited by the values assigned for a different function, the name of the limiting function is displayed in place of the minimum and maximum values.

Test Menu

NOTE: Some tests may not apply to all models.

Press the *test* key to enter the *TEST* mode. The LED in the corner of the *test* key illuminates to indicate that the programmer has been placed in the *TEST* mode. The *TEST* menu displays real-time information about the status of the inputs, outputs, and controller temperature. See Table 5. In the *TEST* mode, the item of interest does not need to be the top item in the window; it only needs to be one of the four items displayed in the window. The *TEST* mode is useful for checking out the operation of the controller during initial installation. The *more info* key, when used in the *TEST* mode, displays additional information about the top item in the window.

Table 5. Test Menu

Test Menu Display	Description

SYS MODE	Software info for factory troubleshooting.
BATT VOLTAGE	Battery voltage across B+ and B– in volts.
BDI %	Battery state of charge, as % of full charge.
HEAT SINK °C	Heat sink temperature in °C.
THROTTLE %	Throttle reading, as % of full throttle.
FIELD CURRENT	Traction motor field current, in amps.
ARM CURRENT	Traction motor armature current, in amps.
FIELD PWM	Traction motor field duty cycle, as %.
ARM PWM	Traction motor armature duty cycle, as %.
NEUTRAL	Neutral switch: *ON* or *OFF*
MODE INPUT	Mode 2 (M2) selected: *ON* or *OFF*.
EMR REV INPUT	Emergency reverse switch: *ON* or *OFF*.
HYD THROTTLE %	Hydraulic Throttle reading, as % of full throttle.
PUMP CURRENT	Pump motor current, in amps.
PUMP PWM	Pump motor duty cycle, as %.
LV CURRENT	Lowering valve current, in amps.
LV PWM	Lowering valve duty cycle, as %.
LIFT INPUT	Lift switch: *ON* or *OFF*.
LOWER INPUT	Lower switch: *ON* or *OFF*.
MAIN CONT	Main contactor: *OPEN* or *CLOSED*.
E/M BRAKE	Electromagnetic brake: *ON* or *OFF*.
HORN INPUT	Horn driver: *ON* or *OFF*.
LOAD HOLD	Load-hold valve driver: *ON* or *OFF*.

Diagnostics Menu

Press the *diagnostics* key to enter the *DIAGNOSTICS* mode. The LED in the corner of the *diagnostics* key illuminates to indicate that the programmer has been placed in the *DIAGNOSTIC* mode. The *DIAGNOSTICS* menu displays all currently active faults detected by the controller. It is capable of displaying 20 different faults, 4 at a time.

Diagnostic History

Press the *diagnostics* key and the *more info* key simultaneously to enter the *DIAGNOSTIC HISTORY* menu. The *DIAGNOSTIC HISTORY*menu lists all of the faults observed and recorded by the controller since the history was last cleared. Press the *scroll down* key to display any recorded faults. Each fault will be listed only once, regardless of the number of times the fault may have occurred.

The diagnostic history can be cleared from the controller using the *special program menu* function *CLEAR DIAG HISTORY*. Press the *program* key while holding the *more info* key. Press the *scroll down* key until *CLEAR DIAG HISTORY* appears in the top line of the display. Press the *more info* key again, and then press the *value up* key to clear the history, or the *value down* key to cancel the operation.

Special Program Menu

Press and hold the *more info* key, then press the *program* key to enter the *SPECIAL PROGRAM* menu. See Table 6. The *SPECIAL PROGRAM* menu allows the user to: return the controller to previous settings, save controller settings to the programmer memory, load controller settings from the programmer memory, clear diagnostic history, adjust the contrast of the programmer display, select language, and display basic controller and programmer information. Press the *scroll display* key until the desired function is on the top line. Press the *more info* key for information on how to make the desired adjustment.

Table 6. Special Program Menu

Special Program Menu Display	Definition
RESET ALL SETTINGS	Revert to previous settings.
CONT SETTINGS→PROG	Save controller settings to programmer.
PROG SETTINGS→CONT	Load programmer settings to controller.
CLEAR DIAG HISTORY	Clear *DIAGNOSTIC HISTORY* memory.
CONTRAST ADJUSTMENT	Adjust programmer display contrast.
LANGUAGE SELECTION	Select displayed language.
PROGRAMMER INFO	Display programmer information.
CONTROLLER INFO	Display controller information.

The *SPECIAL PROGRAM* menu also allows the user to "clone" controllers. After one controller is programmed with all of the desired values, the values can be saved to the programmer handset memory. The programmer handset can then be used to load the saved values to other similar controllers (same model number).

Programming Traction Motor Controller - 1307 Handset

WARNING

NEVER adjust function settings outside the range recommended for the specific truck model.

Program changes affect lift truck performance and operation. If function settings are changed, make sure all operators of the lift truck know that the truck has been changed and may operate differently.

1. Turn the key switch to the **OFF** position.

2. Disconnect and separate battery connector.

3. Remove drive unit compartment cover.

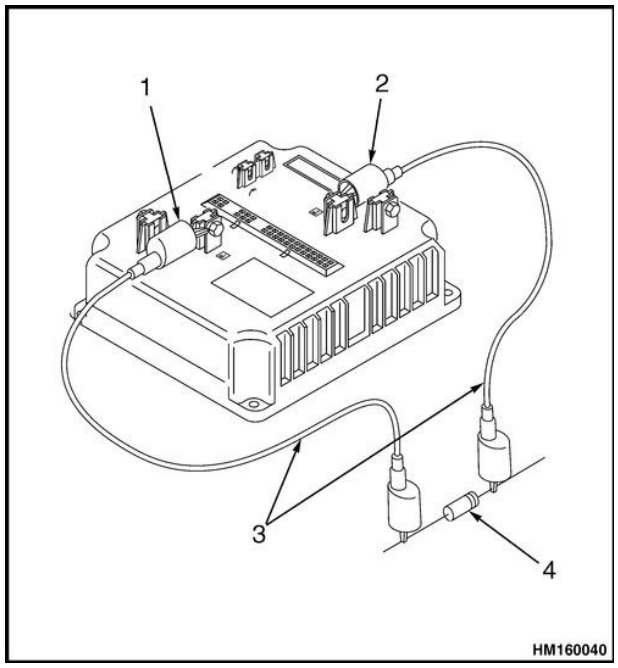
WARNING

The capacitor in the traction motor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and injury, discharge the capacitor before inspecting or repairing any component. Wear safety glasses. Make certain the battery has been disconnected. Discharge the capacitors using the recommended procedures and never by any other method.

4. Discharge the capacitors in the traction motor controller by connecting a 200-ohm, 2-watt resistor across the controller's B+ and B– terminals using two insulated jumper wires. See Figure 5.

5. Connect programmer handset to traction motor controller. The cord of the handset plugs into the J3 connector on the front of the controller.

NOTE: Each time the programmer handset is connected to the controller, it acquires all of the controller function value settings and stores them in its temporary memory. This allows the user to return to the original settings at any time. The *SPECIAL PROGRAM* menu selection *RESET ALL SETTINGS* is used to revert to the original settings. Any unwanted change made to any of the function values can be "undone" in this manner, as long as the programmer has not been unplugged or the key switch has not been turned to the **OFF** position (power disconnected).



1. POSITIVE CONNECTION
2. NEGATIVE CONNECTION
3. JUMPER WIRES
4. 200-OHM, 2-WATT RESISTOR

Figure 5. Discharging the Capacitors

6. Reconnect battery.

7. Turn the key switch to the **ON** position.

8. Press the *program* key on programmer handset. The green LED in the corner of the *program* key lights up to indicate the handset has been placed in the *PROGRAM* mode.

9. Press the *scroll display* keys, as required, until the desired function is shown on the top line of the display.

10. Press the *more info* key to display additional information, if desired, on the selected function. The green LED in the corner of the *more info* key lights up to indicate that the *MORE INFO* option has been selected.

WARNING

NEVER adjust function settings outside the range recommended for the specific truck model.

11. Press the *change value* key to change the function value higher or lower, as required. A green LED on each *change value* key lights up to indicate that the function value can be changed in the corresponding direction. If the green LED on one of the *change value* keys is not illuminated, the value has reached the limit for the corresponding direction.

WARNING

Program changes affect lift truck performance and operation. If function settings are changed, make sure all operators of the lift truck know that the truck has been changed and may operate differently.

12. Press the *more info* key to return to the *PROGRAM* menu if the *MORE INFO* screen had been selected.

13. Repeat Step 9 through Step 12, as required, until all of the functions are set to the desired values.

NOTE: Any unwanted change made to any of the function values can be "undone" using the *SPECIAL PROGRAM* menu selection *RESET ALL SETTINGS*, as long as the programmer has not been unplugged or the key switch has not been turned off (power disconnected).

14. Turn the key switch to the **OFF** position.

15. Disconnect and separate battery connector.

WARNING

The capacitor in the traction motor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and injury, discharge the capacitor before inspecting or repairing any component. Wear safety glasses. Make certain the battery has been disconnected. Discharge the capacitors using the recommended procedures and never by any other method.

16. Discharge capacitors in controller by connecting a 200-ohm, 2-watt resistor across the controller's B+ and B– terminals with two insulated jumper wires. See Figure 5.

17. Disconnect programmer handset cord from traction motor controller.

18. Install drive unit compartment cover.

19. Reconnect battery.

1311 Programmer Handset

DESCRIPTION/FEATURES

The programmer handset is a handheld tool that allows the user to program, test, and diagnose the traction motor controller. See Figure 6. It has been designed for ease of use with a *menu navigation* key, a *data increase/decrease* key, and 3 *bookmark* keys to control all programmer functions.

The display window contains a 7-line, 128 × 64 pixel LCD screen that is capable of displaying both text and graphics simultaneously. The window is visible in most lighting conditions and can be adjusted using the programmer setup menu.

The programmer is menu driven and accesses submenus by pressing the *menu navigation* key.

When the programmer is connected to the motor controller, all current motor controller information is uploaded into the 1311 programmer handset and ready for viewing. This upload is used by the programmer to generate menu items that will be displayed by the programmer.

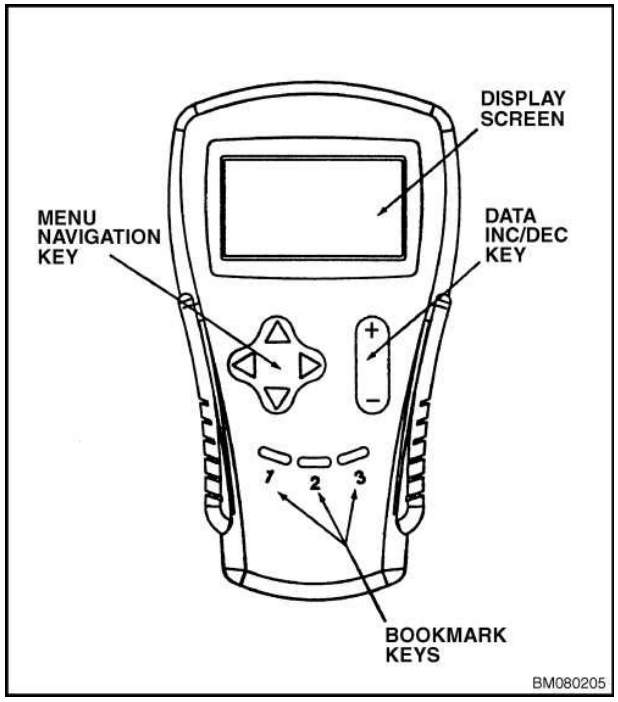


Figure 6. Curtis Model 1311 Programmer Handset

Menu Navigation Key

The *menu navigation* key is a 4-position switch that allows you to move up and down a menu list using the up or down arrows, or you can open and close submenus using the right and left arrows. Use the *menu navigation* key to move up or down through the main menu items. There is a blinking square on the left side of the programmer that indicates the current menu selection. See Figure 7.

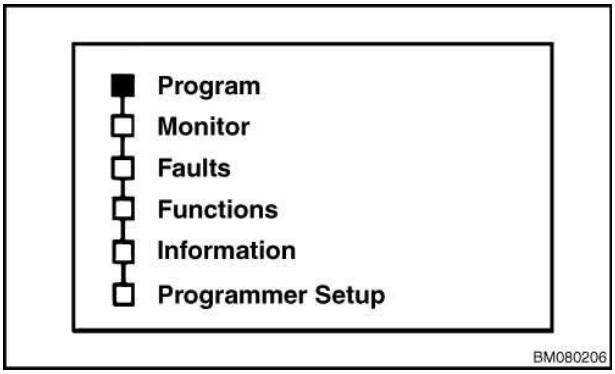


Figure 7. Menu Selection

After selection of a main menu item, submenus for the main selection can be opened using the right arrow. See Figure 8. As submenus are opened, a new series of indicator boxes will appear with a blinking square to indicate the current submenu selection. You can move up and down within the submenus using the up and down arrows. Pressing the left arrow will return the programmer to the main menu. Pressing the right arrow while in a submenu will bring up an additional information screen about the submenu item previously selected. See Figure 9.

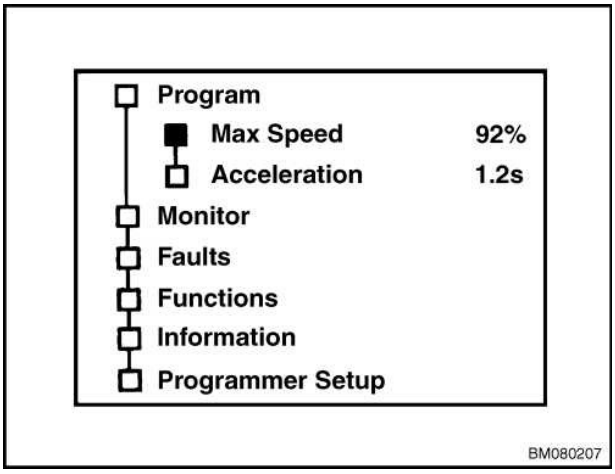


Figure 8. Menu Selection

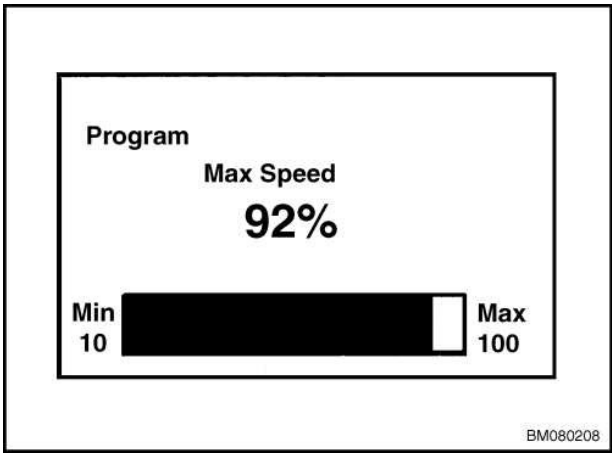


Figure 9. Menu Selection

Data Increase/Decrease Key

The *data increase/decrease* key allows the adjustment of various parameter settings. Press the (+) side of the *data increase/decrease* key to increase a value or press the (–) side of the *data increase/decrease* key to decrease a value. See Figure 6.

Bookmark Keys

There are 3 *bookmark* keys that can be set by the user. These keys allow you to bookmark your position within the menu structure, allowing you to quickly return to a selection without having to

re-navigate the entire menu structure. While you are positioned at a menu item you want to bookmark, press one of the *bookmark* keys and hold it down for 4 seconds until the *BOOKMARK SET* screen appears. You can return to this preset menu item at any time by pressing the *bookmark* key you assigned to this item. Bookmarks are permanently retained in the programmer memory. Once the programmer has been unplugged or power to the controller has been interrupted, the bookmarks are cleared from the programmer memory. See Figure 6.

OPERATION

Connecting Handset to Traction Motor Controller

NOTE: Each time the programmer handset is connected to the controller, it acquires all of the controller function value settings and stores them in its temporary memory. This allows the user to revert back to the original settings at any time. The *SPECIAL PROGRAM MENU* selection *RESET ALL SETTINGS* is used to revert to the original settings. Any unwanted change made to any of the function values can be undone in this manner, as long as the programmer has not been unplugged or the key switch has not been turned to the **OFF** position (power disconnected).

1. Turn the key switch to the **OFF** position.

2. Disconnect the battery.

3. Remove drive unit compartment cover.

WARNING

The capacitor in the traction motor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and injury, discharge the capacitor before inspecting or repairing any component. Wear safety glasses. Make certain the battery has been disconnected. Discharge the capacitors in the controller by connecting a load (such as a contactor coil or a horn) across the controller's B+ and B– terminals. DO NOT use a screwdriver to discharge the traction motor controller.

4. Discharge the capacitors in the controller.

5. Connect programmer handset to the 4-pin Molex™ connector on the traction motor controller.

6. Reconnect the battery.

7. Turn the key switch to the **ON** position.

Disconnecting the Handset From the Traction Motor Controller

1. Turn the key switch to the **OFF** position.

2. Disconnect the battery.

WARNING

The capacitor in the traction motor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and injury, discharge the capacitor before inspecting or repairing any component. Wear safety glasses. Make certain the battery has been disconnected. Discharge the capacitors in the controller by connecting a load (such as a contactor coil or a horn) across the controller's B+ and B– terminals. DO NOT use a screwdriver to discharge the traction motor controller.

3. Discharge the capacitors in the controller.

4. Disconnect programmer handset from the 4-pin Molex™ connector on the traction motor controller.

NOTE: The programmer handset should only be connected and disconnected with the key switch in the **OFF** position.

5. Install drive unit compartment cover.

6. Reconnect the battery.

MAIN MENU SELECTIONS

Program Menu

The program menu will contain submenus of adjustable parameters downloaded to the programmer from the motor controller. The motor controller can be setup for specific operating conditions by changing the parameters that can be accessed through the program menu selections. Those parameters that can be adjusted by the handset will be shown as submenu items under the program menu.

Use the up or down arrow on the *menu navigation* key to select a parameter. See Figure 10. Press the right arrow key to access the detail screen for the selected parameter. See Figure 11. The detail screen will show the measurement units, min/max range for the parameter, and a bar graph indicating the current parameter setting. The setting may be changed using the *data increase/decrease* key. Press the (+) side of the key to increase the value or press the (–) side of the key to decrease the value.

To return to the program menu or the main menu, press the left arrow on the *menu navigation* key.

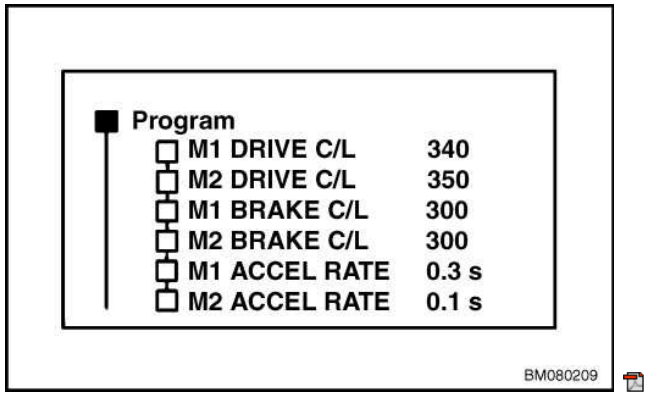


Figure 10. Menu Selection

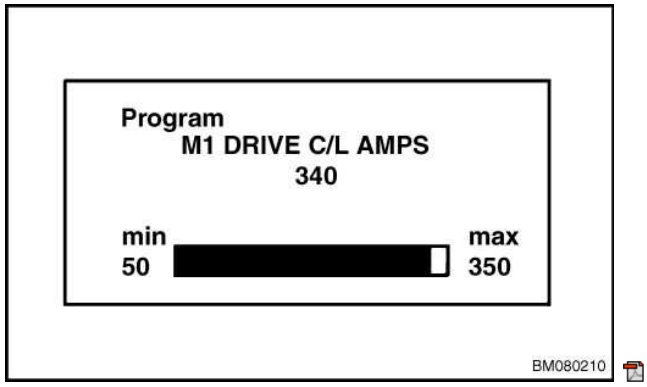


Figure 11. Menu Selection

Monitor Menu

The monitor menu will contain a list of all truck functions that can be read and displayed by the programmer. Using the *menu navigation* key, scroll up or down to select a parameter from the list. See Figure 12. Each menu item is constantly monitored and displayed to show real-time information about the selected function.

To view a single function in real time, press the right arrow on the *menu navigation* key and a detail screen about the selected parameter will appear. See Figure 13.

To return to the monitor menu or the main menu, press the left arrow on the *menu navigation* key.

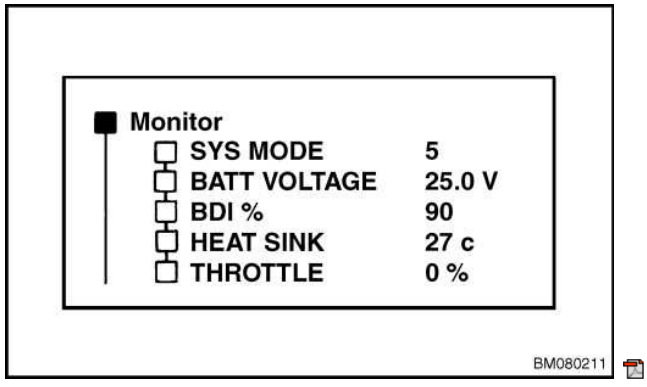


Figure 12. Menu Selection

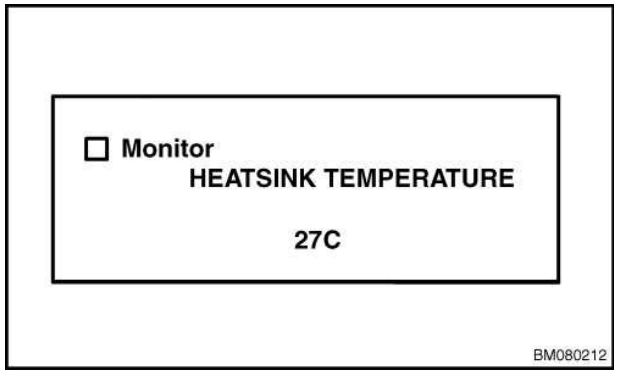


Figure 13. Menu Selection

Faults Menu

The *FAULTS* menu will provide the present status of the motor controller and access to past fault history. The fault history is uploaded to the programmer when the programmer is connected to the motor controller. Use the *menu navigation* key to access system faults, fault history, or to clear the fault history. See Figure 14.

System faults will show the current state of the motor controller. See Figure 15.

Fault history will list the faults that have been stored in the motor controller memory. These faults will be shown as descriptive text of the fault. Scroll through the faults using the up and down arrows on the *menu navigation* key. See Figure 16.

CLEAR FAULT HISTORY is used to remove faults from the controller memory after review. Use the (+) side of the *data increase/decrease* key to delete the faults from memory.

NOTE: You will be asked to confirm that you do want to clear the fault history. Use the (–) side of the *data increase/decrease* key to cancel any action and not clear the fault history.

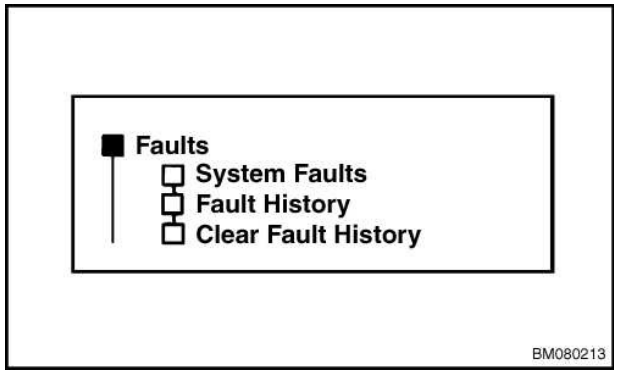


Figure 14. Menu Selection

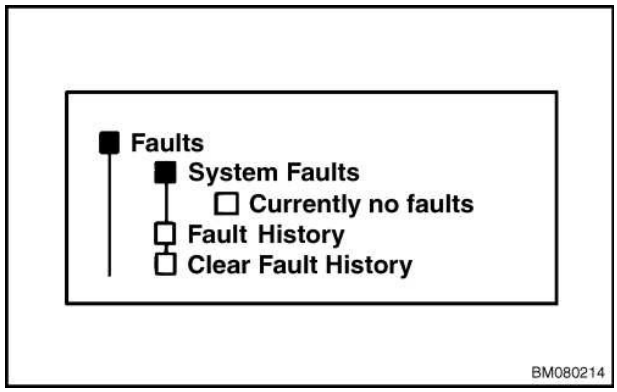


Figure 15. Menu Selection

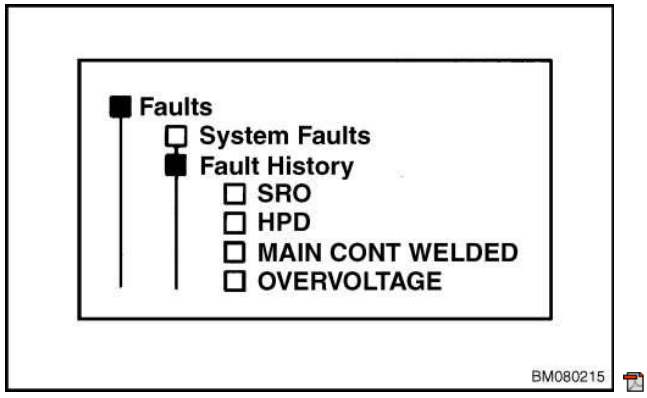


Figure 16. Menu Selection

Functions menu

The *FUNCTIONS* menu is used to copy data between motor controllers or reset the data in a controller to the original settings. Use the *menu navigation* key to select the *FUNCTIONS* menu to access the *SETTINGS* menu. See Figure 17. From this menu you can upload the parameter block from an existing controller and download that parameter block into another motor controller. See Figure 18.

Each time the programmer is connected to a motor controller, it uploads the present data from the controller into the programmer. Using the *SETTINGS* menu, this original information can be downloaded into the controller at any time to restore the controller with the original data. Any inadvertent change in controller parameters can be undone using this feature as long as the programmer has not been disconnected from the controller or the power has not been removed from the controller.

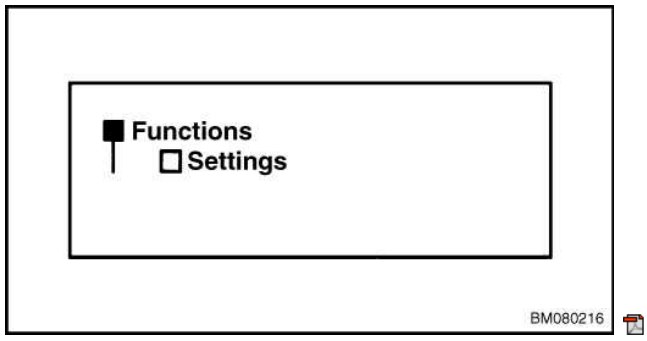


Figure 17. Menu Selection

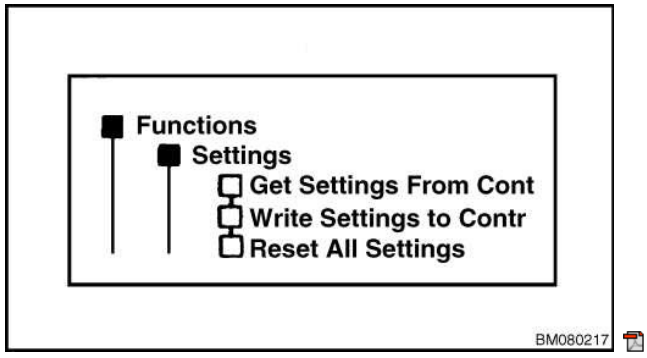


Figure 18. Menu Selection

Information Menu

The *INFORMATION* menu will display information about the controller. Use the *menu navigation* key to select the information menu and all specific controller information will be displayed on the screen. See Figure 19.

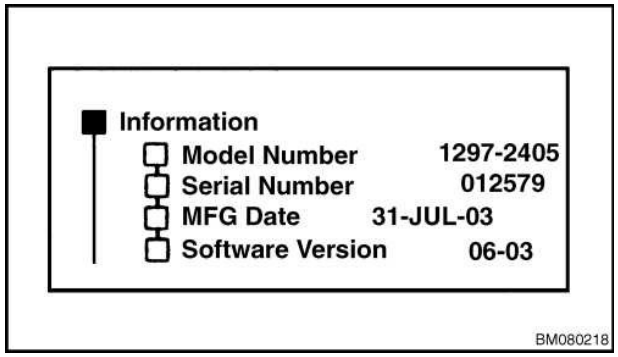


Figure 19. Menu Selection

Programmer Setup Menu

The *PROGRAMMER SETUP* menu contains several items that can be viewed, setup, or customized to the user's preference. See Figure 20.

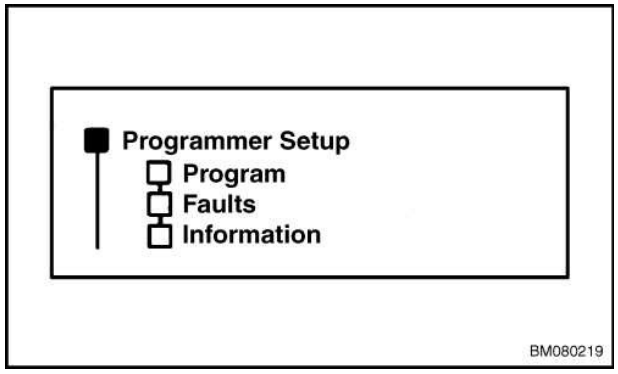


Figure 20. Menu Selection

Programming the Traction Motor Controller - 1311 Handset

WARNING

NEVER adjust function settings outside the range recommended for the specific truck model. See Table 1 or Table 3.

Program changes affect lift truck performance and operation. If function settings are changed, make sure all operators of the lift truck know that the truck has been changed and may operate differently.

1. Turn the key switch to the **OFF** position.

2. Disconnect and separate the battery connector.

3. Remove drive unit compartment cover.

WARNING

The capacitor in the traction motor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and injury, discharge the capacitor before inspecting or repairing any component. Wear safety glasses. Make certain the battery has been disconnected. Discharge the capacitors using the recommended procedures and never by any other method.

4. Discharge the capacitors in the traction motor controller by connecting a 200-ohm, 2-watt resistor across the controller's B+ and B– terminals using two insulated jumper wires.

5. Connect programmer handset to traction motor controller. The cord of the handset plugs into the J3 connector on the front of the controller.

NOTE: Each time the programmer handset is connected to the controller, it acquires all of the controller function value settings and stores them in temporary memory. This allows the user to return to the original settings at any time. Any unwanted change made to any of the function values can be undone in this manner, as long as the programmer has not been unplugged or the key switch has not been turned to the **OFF** position (power disconnected).

6. Reconnect the battery.

7. Turn the key switch to the **ON** position.

8. Select the *PROGRAM* menu on the programmer handset.

9. Use the up or down arrows on the *menu navigation* key to scroll until the desired function is reached.

10. Press the right arrow on the *menu navigation* key to enter the function being changed.

WARNING

NEVER adjust function settings outside the range recommended for the specific truck model.

See Table 1 or Table 3.

11. Using the *data increase/decrease* key, change the function setting to the new setting. Pressing the (+) side of the key will increase the parameter value. Pressing the (–) side of the key will decrease the parameter setting.

WARNING

Program changes affect lift truck performance and operation. If function settings are changed, make sure all operators of the lift truck know that the truck has been changed and may operate differently.

12. Press the left arrow on the *menu navigation* key to return to the *PARAMETERS* menu.

13. Repeat Step 8 through Step 12, as required, until all of the functions are set to the desired value.

NOTE: Any unwanted change made to any of the function values can be undone using the *RESET ALL SETTINGS* from the *FUNCTIONS* menu as long as the programmer has not been unplugged or the key switch has not been turned to the **OFF** position (power disconnected).

14. Turn the key switch to the **OFF** position.

15. Disconnect the battery connector.

WARNING

The capacitor in the traction motor controller can hold an electrical charge after the battery is disconnected. To prevent electrical shock and injury, discharge the capacitor before inspecting or repairing any component. Wear safety glasses. Make certain the battery has been disconnected. Discharge the capacitors using the recommended procedures and never by any other method.

16. Discharge the capacitors in the traction motor controller by connecting a 200-ohm, 2-watt resistor across the controller's B+ and B– terminals using two insulated jumper wires.

17. Disconnect the programmer handset from the controller.

18. Install the drive unit compartment covers.

19. Reconnect the battery.

Parameters

ADJUSTING PARAMETERS

NOTE: M2 parameters do not apply to MPW060E, MPW065E, and MPW080E.

Top Speed

The *M1 Max Speed* parameter adjusts the top speed of the truck when in Walk mode. The *M2 Max Speed* parameter adjusts the top speed of the truck when in Rabbit mode. Decrease this setting to reduce the top speed and increase this setting to raise the top speed of the truck. The M1 adjustable range is from 25% to 48%. The M2 adjustable range is from 25% to 100%.

Acceleration

The *M1 Accel Rate* and the *M2 Accel Rate* parameters adjust the acceleration of the truck. This is true in both Walk and Rabbit modes or M1 and M2. Decrease this setting to quicken the acceleration of the truck, and increase this setting to soften the acceleration of the truck. The adjustable range is from 0.1 to 3.0 sec.

Neutral Braking

The *M1 Decel Rate* and the *M2 Decel Rate* parameters adjust the response of the truck when returning to neutral. Decrease this setting to strengthen the neutral braking of the truck, and increase this setting to weaken the neutral braking of the truck. The adjustable range is from 0.1 to 10.0 sec.

Plug Braking

The *M1 Brake C/L* and the *M2 Brake C/L* parameters adjust the response of the truck when plug braking. Decrease this setting to soften the plug braking of the truck, and increase this setting to strengthen the plug braking of the truck. The adjustable range is from 75 amps to 350 amps.

Coast Braking (MPE060-E/MPE080-E Only)

The *Coast C/L* parameter adjusts the response of the truck when releasing the *quick pick* switch. Decrease this setting to soften the coast braking of the truck, and increase this setting to strengthen the coast braking of the truck. The adjustable range is from 25 amps to 350 amps.

Empty Volts

The *BDI Empty Volts* parameter sets the voltage considered to be a 0% state of charge. If using sealed, maintenance-free batteries, set this parameter to 190. Otherwise, leave at factory setting.

Battery Discharge Indicator (BDI)/Hourmeter

The 8-character LCD on the optional BDI/Hourmeter displays provides a continuous sequence of hourmeter, battery state of charge, and fault messages. See Figure 21. Fault messages are displayed using the same codes that are flashed by the controller's LED. For example, code "3,2" (Main Contactor Welded) appears as CODE 32.

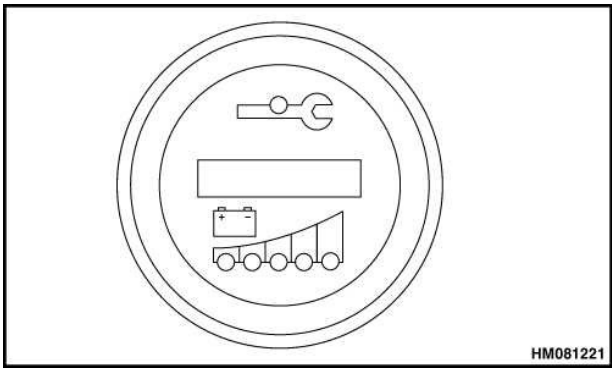


Figure 21. BDI/Hourmeter

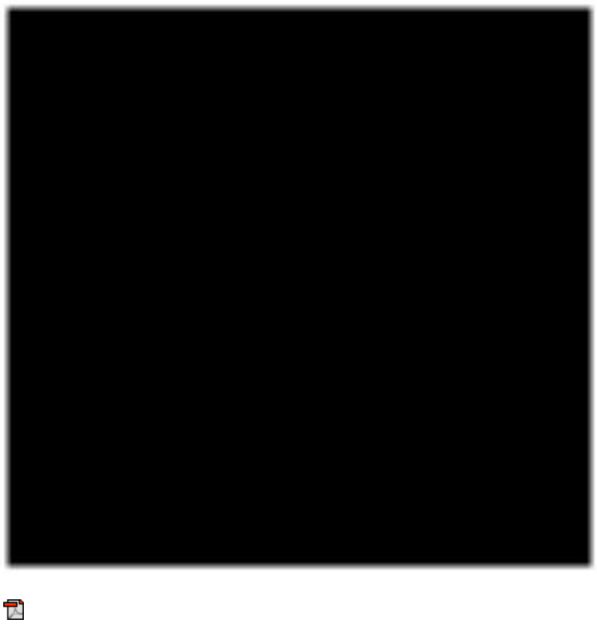
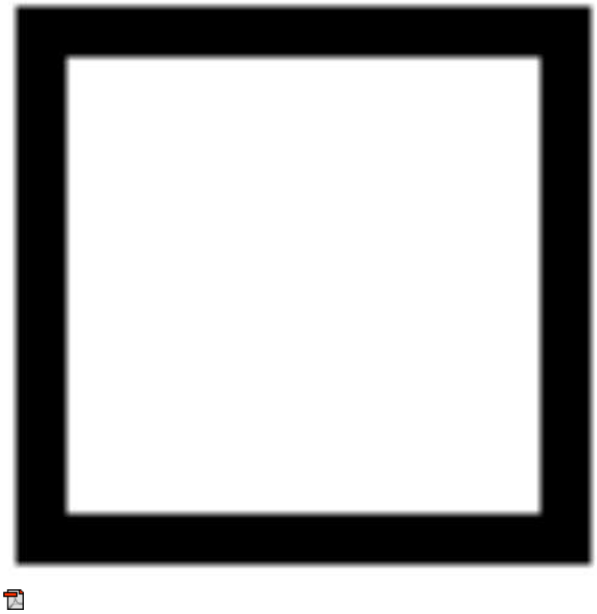
LED Fault Codes

The Curtis 1297 controller has a Status LED built into it and can be seen through a window in the label on top of the controller. This Status LED displays fault codes. During normal operation, with no faults present, the Status LED flashes steadily on and off like a heartbeat. If the controller detects a fault, a two-digit fault identification code is flashed until the fault is corrected. For example, code "3,2" (Main Contactor Welded) appears as: 3 flashes, short pause, 2 flashes, long pause; repeat.

NOTE: Only one fault is recognized and indicated at a time by the Status LED. Multiple faults may be read using the programmer handset. See 1307 Programmer Handset.

The 3 most common Status LED messages are shown in Table 7.

Table 7. Status LED Fault Codes

LED Codes	Description
LED Off	No power or defective controller
Solid On	Controller or microprocessor fault
0,1  	Controller operational; no known faults

Fault codes 11, 13, 23, 32, 34, or 42 may intermittently appear during truck use. These signals may be sent as a result of power loss to the 1297 controller from the battery. Turning the key switch **OFF** and then **ON** again will usually clear these fault codes. If the codes remain after cycling the key switch, the lift truck must be serviced.

If these intermittent faults continually appear, perform the following checks:
- Check for loose cable connections at the battery cable connectors.
- Check for loose wiring and wire connectors at the controller.
- Check for loose cable connections at the battery.
- Check battery cells for proper voltage and state of charge.

If a loose wire or connection if found, make the necessary repairs before returning the truck to service.

Fault codes 20, 32, or 34 may also intermittently appear after the battery has been changed. If the BDI indicator will not reset, this may indicate that the battery is not properly charged. Always install fully charged, properly functioning batteries to the lift truck.

NOTE: Minimum reset voltage for the BDI is 25.2 volts (open cell), specific gravity should be approximately 1.250 per cell.

LED Code	Dash Display	Model	Programmer Display
LED OFF		All	Handset Does Not Operate

Condition
Truck, dash display, controller LED are inoperative with the key switch in the **ON** position.

Truck Response
No Operation

Possible Causes and Test Procedures

1. B+ or B– is missing at the controller.
Confirm battery is connected.
Confirm correct battery voltage.
Check continuity of battery cables between battery and controller.

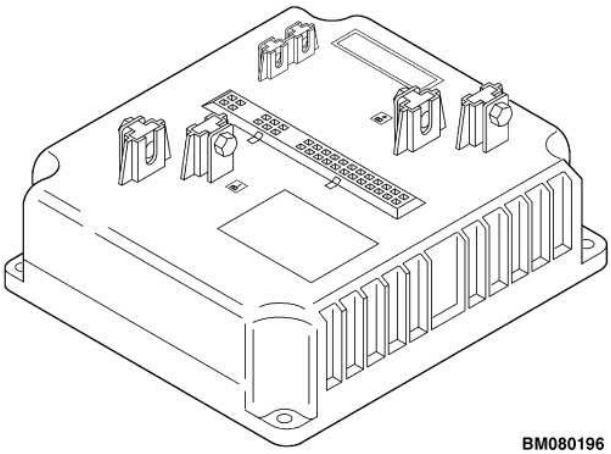
2. Verify the key switch is in the **ON** position.

3. Check condition of FU 1.
Refer to the section **Electrical System** 2200 YRM 1052 or **Electrical System** 2200 YRM 929, Fuses.

4. Check for battery voltage at pin #J1-1.
Verify key switch is in the **ON** position.
Check condition of FU 2. Refer to **Electrical System** 2200 YRM 1052 or **Electrical System** 2200 YRM 929, Fuses.

5. Defective motor controller.
Replace controller.

Circuit Description



Logic
This will occur when there is no power to the controller or the controller is defective.

LED Code	Dash Display	Model	Programmer Display
1,1	Code 11	All	Drive Sensor

Condition
Handset is plugged into the traction motor controller. Key switch is in the **ON** position. Diagnostic menu is selected.

Truck Response
No Traction

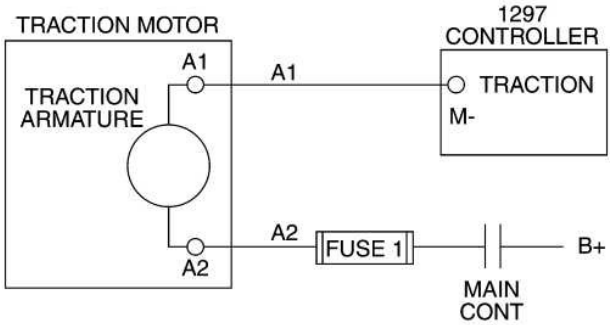
Possible Causes and Test Procedures

1. Incorrect traction motor wiring.
Check wiring to traction motor.
Loose, worn, or frayed wires?
Motor wiring correctly installed?

2. Check for motor shorted to frame.
Disconnect leads from motor.
Resistance between frame and motor terminal should be 1 mega ohm or more.

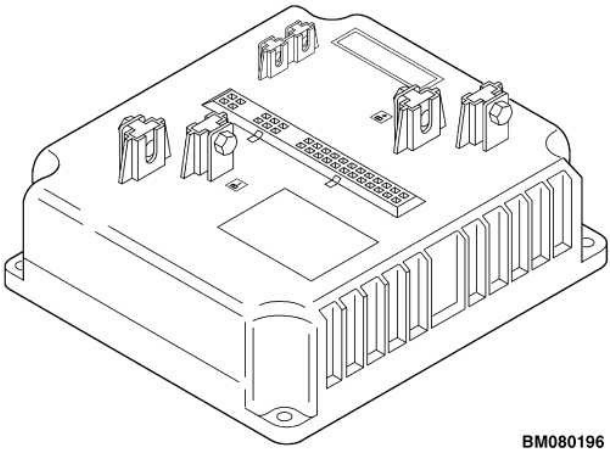
3. Check for controller shorted to B–.

Circuit Description

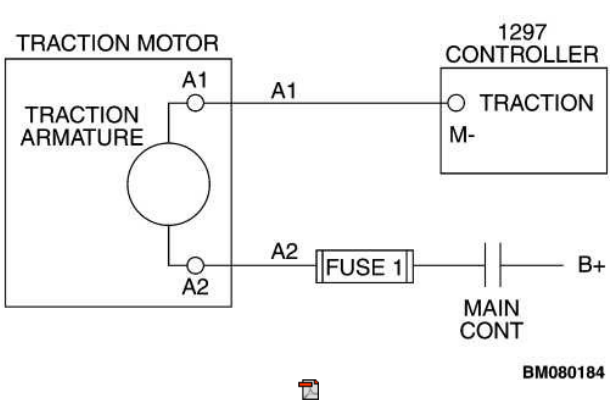


Disconnect motor leads from controller. Resistance between motor terminals on controller and B– should be 1 mega ohm or more.	**Logic** Traction motor current sensor error. The controller uses the traction motor current sensor to detect incorrect current in the traction motor circuit.

LED Code	Dash Display	Model	Programmer Display
1,2	Code 12	All	HW Failsafe

Condition Self Test or Watchdog Error. **Truck Response** No Controller Operation **Possible Causes and Test Procedures** **1.** Turn key switch to **OFF** position to reset the controller. **2.** If fault reoccurs, replace controller.	**Circuit Description**  BM080196 **Logic** Displayed when the internal check logic of the controller determines an internal failure of the controller.

LED Code	Dash Display	Model	Programmer Display
1,3	Code 13	All	Drive M–

Condition External short of Traction motor M– to B–. **Truck Response** No Traction **Possible Causes and Test Procedures** **1.** Incorrect traction motor wiring. Check wiring to traction motor. Ensure all wiring connections are tight. **2.** Traction motor shorted to frame. Disconnect motor leads at motor. Measure resistance between motor terminals and truck frame. If less than 1 megohm, replace motor. **3.** M– short in controller. Verify voltage between B– and M– to be 10% less than nominal battery volts. If greater than 10%, replace controller. Disconnect motor leads at controller. Measure resistance between B– and M–. If less than 1 megohm, replace controller.	**Circuit Description**  BM080184 **Logic** The controller uses an internal check to ensure the traction motor M– connection is not shorted to B– (Battery Negative).

LED	Dash	Model	Programmer Display

Code	Display		
1,4	Code 14	MPE060E, MPE080E, MPW060E, MPW065E, MPW080E, MPC060-E, MPC080-E	Valve Fault

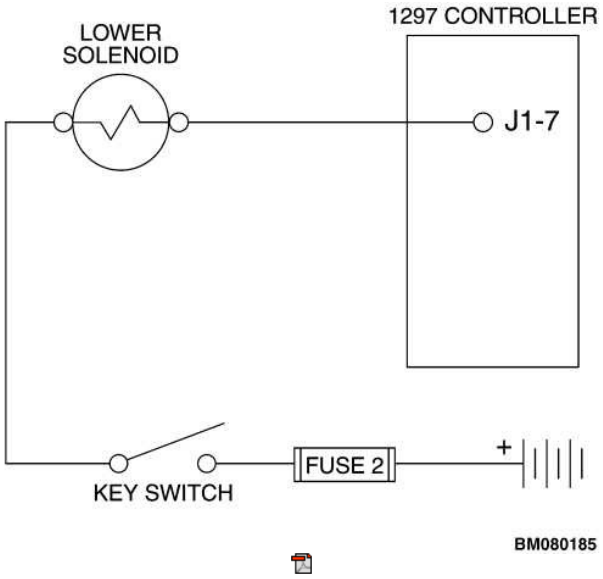
Condition
Low current sensed in lowering solenoid coil circuit when lower function is selected.

Truck Response
No Lowering Function

Possible Causes and Test Procedures

1. Check wiring to the lowering solenoid coil.
   Ensure all wiring and connectors are tight.
2. Remove wiring from lowering solenoid coil.
   Check coil resistance across the terminals where wires were removed.
   All models = approximately 35 ohms.
3. Check for continuity between key switch and lowering coil.
4. Check for continuity between lowering coil and pin #J1-7 at controller.
5. Check for battery voltage at lowering coil with key switch closed.

Circuit Description



Logic
The controller performs a check to ensure the presence of the lowering valve solenoid coil. If the coil current value is less than 0.5 amps when lower function is selected, the controller will show this fault.

LED Code	Dash Display	Model	Programmer Display
2,0	Code 20	All	BDI Low

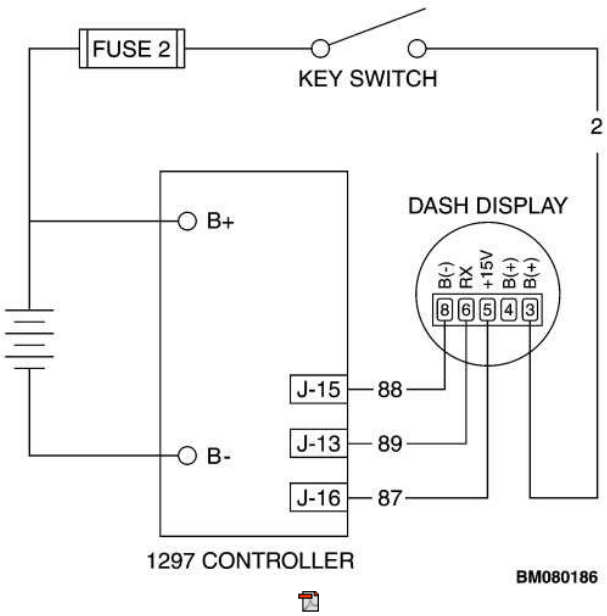
Condition
Battery state of charge is less than 20% of full charge.

Truck Response
No Hoist/Lift Lockout

Possible Causes and Test Procedures

1. Battery voltage is low.
   Check specific gravity of battery.
   Recharge or change battery.

Circuit Description



Logic
Controller senses battery state of charge.

LED Code	Dash Display	Model	Programmer Display
2,1	Code 21	MPW060E, MPW065E,	Throttle Wiper High

		MPW080E, MPE060E, MPE080E	

Condition
Voltage from the throttle handle is too high.

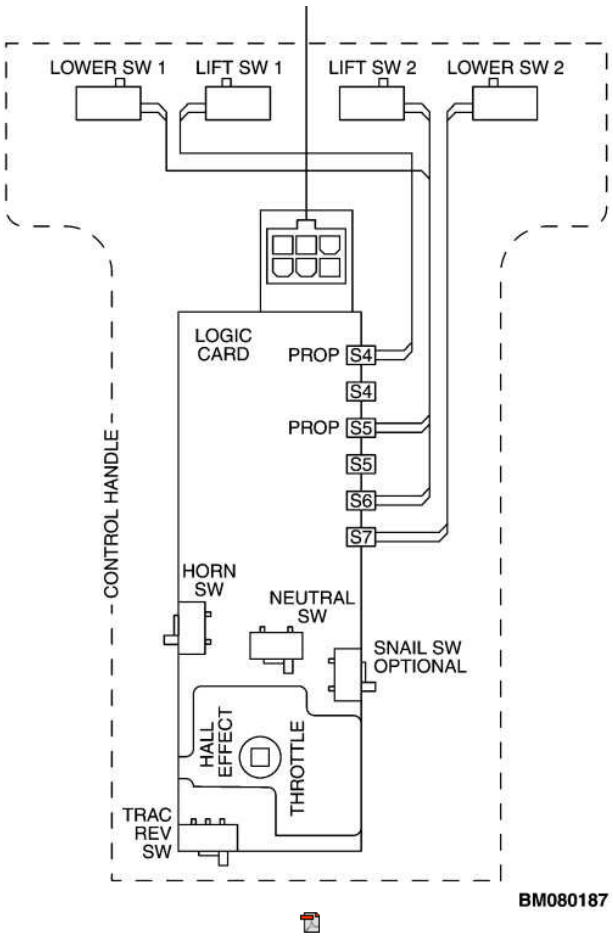
Truck Response
No Traction

Possible Causes and Test Procedures

1. Throttle sensor not centered.
2. Throttle sensor input shorted to B+.
3. Failed throttle sensor.
4. Improper parameters on software, use handset to verify parameters.

For testing procedures, refer to Control Card Functional Test in this section.

Circuit Description



Logic
Controller checks for the throttle signal to be less than 4.8 V.

LED Code	Dash Display	Model	Programmer Display
2,1	Code 21	MTR005-E, MTR007-E, MPC060-E, MPC080-E	Throttle Wiper High

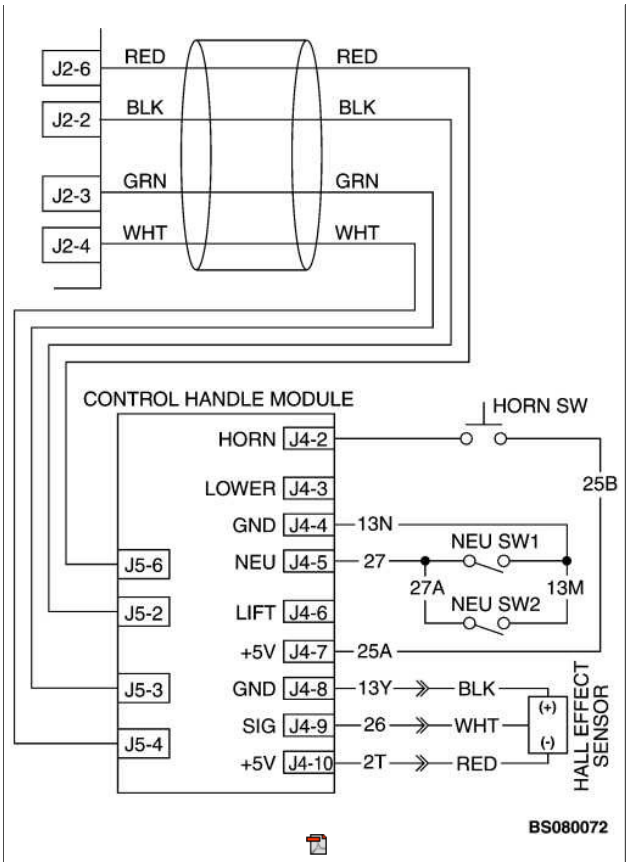
Condition
Voltage from the throttle sensor is too high.

Truck Response
No Traction

Possible Causes and Test Procedures

1. Throttle sensor not centered.
Center the sensor at the control handle. Sensor output = 2.5 V when centered. See **Electrical System** 2200 YRM 1052 .
2. Failed throttle sensor or Interface module defective.
Contact Resident Service Engineering through the Contact Management System.

Circuit Description



Logic
Controller checks for the throttle signal to be less than 4.8 V.

LED Code	Dash Display	Model	Programmer Display
2,1	Code 21	MPW060E, MPW065E, MPW080E, MPE060E, MPE080E	Throttle Wiper Low

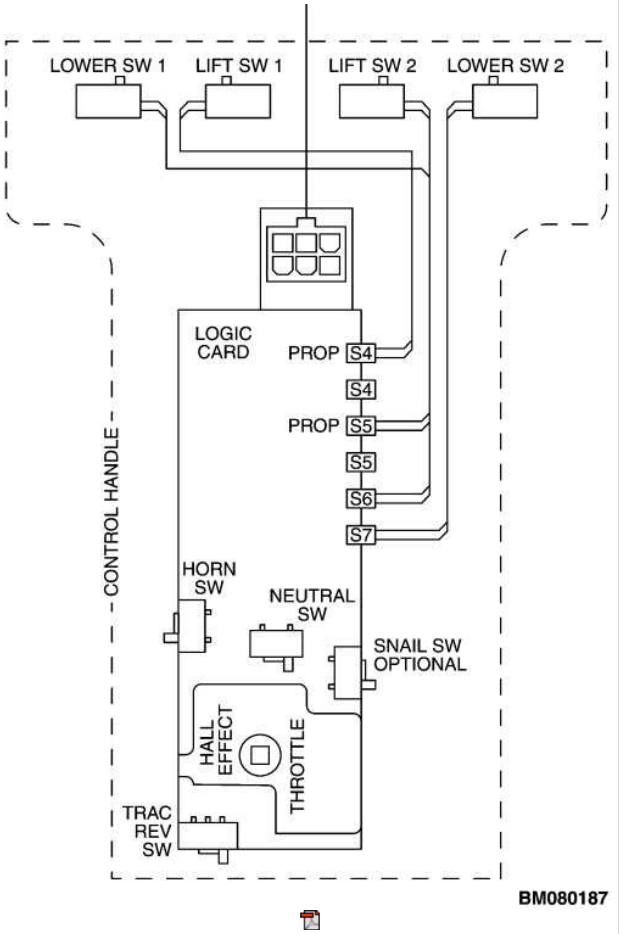
Condition
Voltage from the throttle handle is too low.

Truck Response
No Traction

Possible Causes and Test Procedures
1. Throttle sensor not centered.
2. Throttle sensor input shorted to B–.
3. Failed throttle sensor.
4. Improper parameters on software.

For testing procedures, refer to Control Card Functional Test in this section.

Circuit Description



Logic
Controller checks for the throttle signal to be above 0.1 V.

LED Code	Dash Display	Model	Programmer Display
2,1	Code 21	MTR005-E, MTR007-E, MPC060-E, MPC080-E	Throttle Wiper Low

Condition
Voltage from the throttle sensor is too low.

Truck Response
No Traction

Possible Causes and Test Procedures

1. Throttle sensor not centered.
Center the sensor at the control handle.
Sensor output = 2.5 V when centered. See **Electrical System** 2200 YRM 1052.

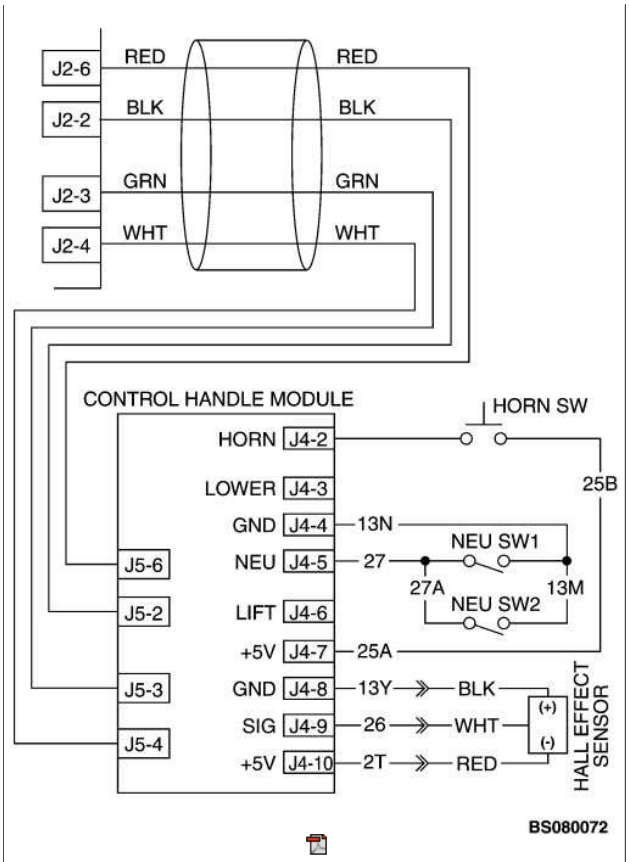
2. Failed throttle sensor.
Replace throttle sensor.

3. Improper parameters on software.

4. Interface module defective.

5. For testing procedures refer to Control Card Functional Test in this section.

Circuit Description



Logic
Controller checks for the throttle signal to be above 0.1 V.

LED Code	Dash Display	Model	Programmer Display
2,2	Code 22	MPE060E, MPE080E, MPW060E, MPW065E, MPW080E	Pump Sensor

Condition
Pump motor current sensor error.

Truck Response
No Lifting

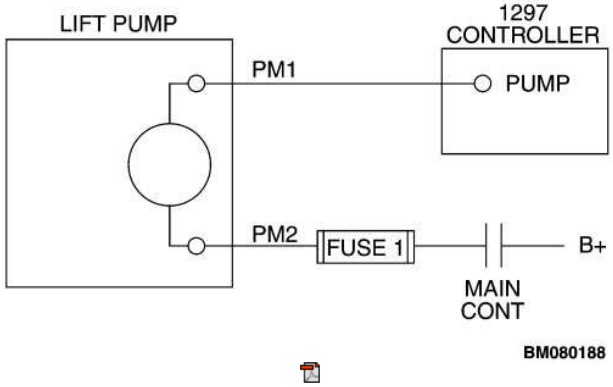
Possible Causes and Test Procedures

1. Incorrect pump motor wiring.
Check wiring to traction motor.
Loose, worn, or frayed wires?
Motor wiring correctly installed?

2. Check for motor shorted to frame.
Disconnect leads from motor.
1 megohm resistance between frame and motor terminal.

3. Check for controller shorted to B–.
Disconnect motor leads from controller.
1 megohm resistance between motor terminals on controller and B–.

Circuit Description



Logic
The controller uses the pump motor current sensor to detect incorrect current in the pump motor circuit.

LED Code	Dash Display	Model	Programmer Display
2,3	Code 23	All	HPD

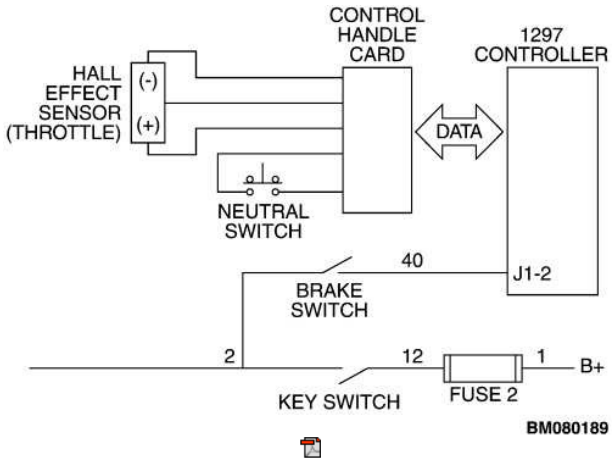
Condition
High Pedal Disable sequencing error.

Circuit Description

Truck Response
No Traction

Possible Causes and Test Procedures

1. Return throttle to neutral.
2. Ensure linkage is allowing throttle to return to neutral.
3. Check throttle Hall Effect sensor is centered.
   Sensor output = 2.5 V when centered.
4. Check connector at J2 is tight and pins are in good condition.
5. Failed throttle sensor.
6. Ensure continuity through proximity switch.
7. Improper parameters on software, use handset to verify parameters.
8. For testing procedures refer to Control Card Functional Test in this section.



Logic
The controller will not drive the motor if the throttle is more than 25% engaged at startup. If the controller receives a throttle input greater than 25% of full speed before the motor is started, the controller will fault and prevent traction.

LED Code	Dash Display	Model	Programmer Display
2,3	Code 23	MPE060E, MPE080E, MPW060E, MPW065E, MPW080E	SRO

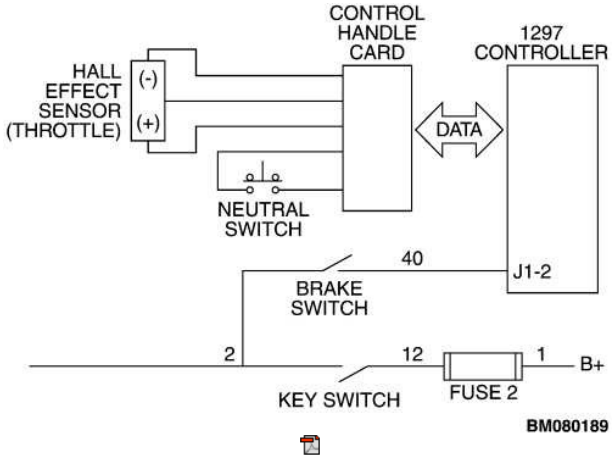
Condition
Static Return to OFF sequencing error.

Truck Response
No Traction

Possible Causes and Test Procedures

1. Ensure proper startup sequence is being followed.
2. Return throttle to neutral.
3. Ensure linkage is allowing throttle to return to neutral.
4. Check throttle Hall Effect sensor is centered.
5. Check connector at J2 is tight and pins are in good condition.
6. Improper parameters on software, use handset to verify parameters.
7. For testing procedures refer to Control Card Functional Test in this section.

Circuit Description



Logic
The controller will not drive the motor unless the following sequence of operation is followed. Turn key switch to **ON** position, activate brake switch, activate direction switch and throttle. If direction switch and throttle are activated before key or brake switch, controller will fault.

LED Code	Dash Display	Model	Programmer Display
2,3	Code 23	All	Anti-Tiedown

Condition
High Speed switch is activated at startup.

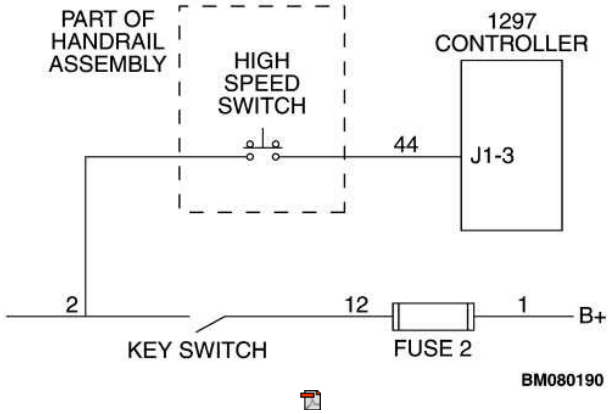
Truck Response
Slow Speed Only

Possible Causes and Test Procedures

1. Check high speed switch is open at startup.
2. Check for voltage on pin #J1-3.
3. Improper

Circuit Description

parameters on software, use handset to verify parameters.
4. For testing procedures refer to Control Card Functional Test in this section.



Logic
If the high speed switch is activated at startup, the controller will fault.

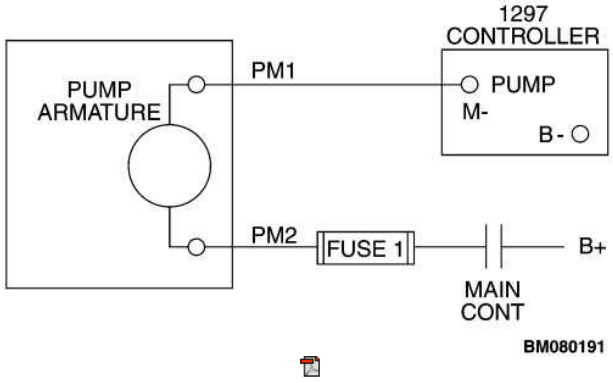
LED Code	Dash Display	Model	Programmer Display
2,4	Code 24	MPE060E, MPE080E, MPW060E, MPW065E, MPW080E	Pump M–

Condition
External short of pump motor M– to B–.

Truck Response
No Lifting

Possible Causes and Test Procedures
1. Incorrect pump motor wiring.
   Check wiring to pump motor.
   Ensure all wiring connections are tight.
2. Pump motor shorted to frame.
   Disconnect motor leads at motor or controller.
   Measure resistance between motor terminals and truck frame. If less than 1 megohm, replace motor.
3. Check for shorted controller.
   Disconnect pump motor leads at controller.
   Measure resistance between B– and Pump M– at the controller. If less than 1 megohm, replace controller.

Circuit Description



Logic
The controller uses an internal check to ensure the pump motor M– connection is not shorted to B– (Battery Negative).

LED Code	Dash Display	Model	Programmer Display
3,0	Code 30	ALL	EM Brake

Condition
Brake is disconnected.

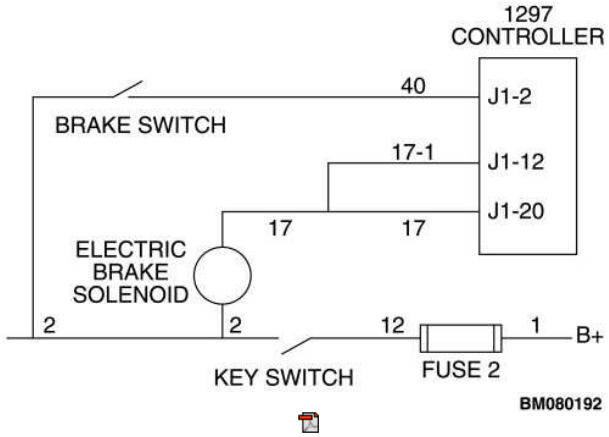
Truck Response
No Traction

Possible Causes and Test Procedures
1. Check brake switch.
   Verify battery voltage at pin #J1-2 when brake switch is closed.
2. Verify B+ voltage at the brake coil connector.
3. Check for correct brake coil resistance.
   MPE080E, MTR007E, and MPC080E = Approx. 10.7 ohms
   MPW060E,

Circuit Description

MPW080E, MPE060E, MTR005E, and MPC060E = Approx. 14.0 ohms
MPW065E = Approx. 4.0 ohms
If open or shorted, replace coil.

4. Check voltage at pin #J1-12 and pin #J1-20. Voltage should be less than battery voltage.
5. If brake still cannot be energized, replace controller.



Logic
Controller will output battery volts at pin #J1-20 when brake switch is closed. The controller monitors the current in the brake circuit and will fault if overcurrent occurs.

LED Code	Dash Display	Model	Programmer Display
3,1	Code 31	MPE060E, MPE080E, MPW060E, MPW065E, MPW080E	Analog MUX Fault

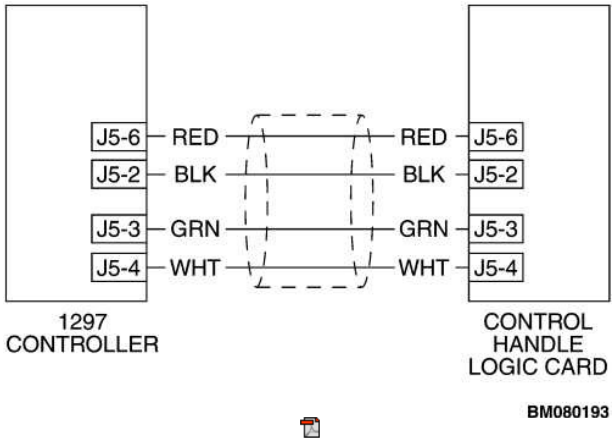
Condition
Controller has lost communication with the control handle logic card.

Truck Response
No Traction

Possible Causes and Test Procedures

1. Ensure the cable is connected to the J2 plug on the controller.
2. Verify all pin connections are tight and making contact.
3. Verify correct connector wiring.
4. Check continuity of the wires running from the controller to the control handle logic card.
   Verify continuity while rotating the control handle arm from side to side.
5. Check for control handle wiring grounded to the truck frame.
6. Check for correct operation of the control handle logic card.
   Use handheld programmer to verify signals from the control handle logic card are being received by the controller.
7. Improper parameters on software, use handset to verify parameters.
8. For testing procedures refer to Control Card Functional Test in this section.

Circuit Description



Logic
The control handle logic card communicates with the controller through the cable between the logic card and the J2 connection on the controller. All signals for speed, direction, emergency reverse, horn, and lift/lower are sent to the controller over this cable.

LED Code	Dash Display	Model	Programmer Display
3,1	Code 31	MTR005-E, MTR007-E, MPC060-E, MPC080-E	Analog MUX Fault

Condition
Controller has lost communication with the control handle interface module.

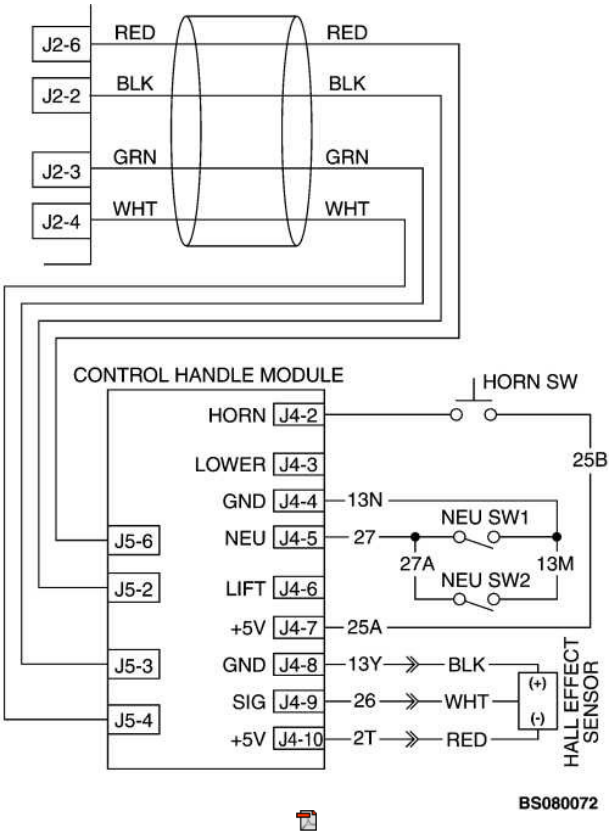
Truck Response

Circuit Description

No Traction

Possible Causes and Test Procedures

1. Ensure the cable between the controller and the control handle interface module is securely connected.
2. Verify the cable from the control handle is secure to the control handle interface module connector.
3. Verify all pin connections are tight and making contact.
4. Check for correct connector wiring.
5. Check continuity of the wires running from the control handle to the control handle interface module.
   Verify continuity while rotating the control handle arm from side to side.
6. Check for control handle wiring grounded to the truck frame.
7. Check for correct operation of the control handle and control handle interface module.
   Use handheld programmer to verify signals from the control handle being received by the controller.
8. Improper parameters on software, use handset to verify parameters.
9. For testing procedures refer to Control Card Functional Test in this section.



Logic

The control handle logic card communicates with the controller through the cable between the control handle interface module and the J2 connection on the controller. All signals for speed, direction, horn, and lift/lower are sent to the controller over this cable.

LED Code	Dash Display	Model	Programmer Display
3,2	Code 32	All	Main Cont Welded

Condition

The main contactor tips are welded.
The main contactor driver is shorted.

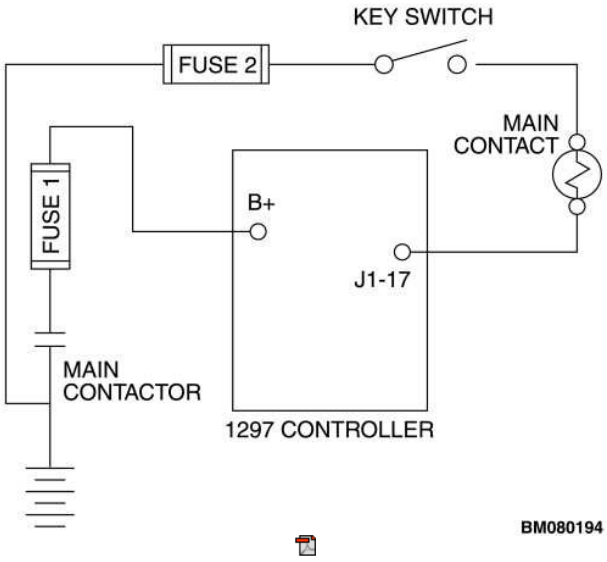
Truck Response

No Traction

Possible Causes and Test Procedures

1. Tips are welded.
   Replace contactor tips. Refer to the section **Electrical System** 2200 YRM 1052 or **Electrical System** 2200 YRM 929, Repairs.
2. Tips are not welded and contactor is being held closed by the controller at startup.
   Replace controller.
3. Check traction motor terminal block for cracks.
4. Verify that traction motor brush leads are tight.
5. Verify that traction motor brushes are free to move in brush box.

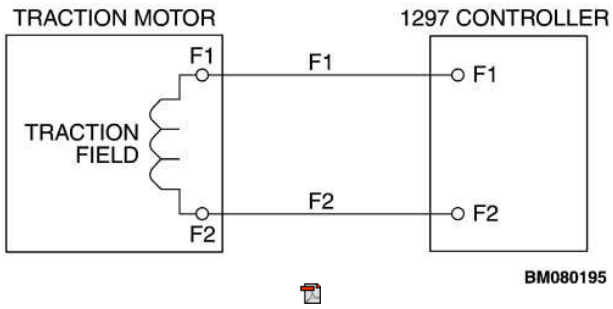
Circuit Description



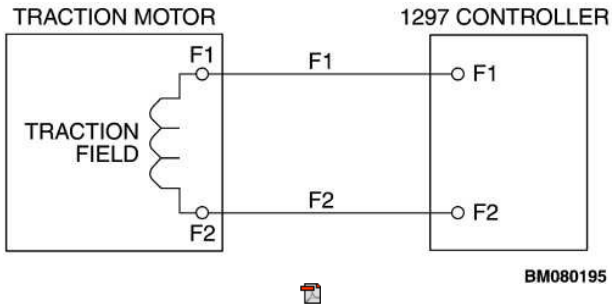
Logic

The controller performs an internal check for welded contactor and missing contactor each time the controller is turned on.

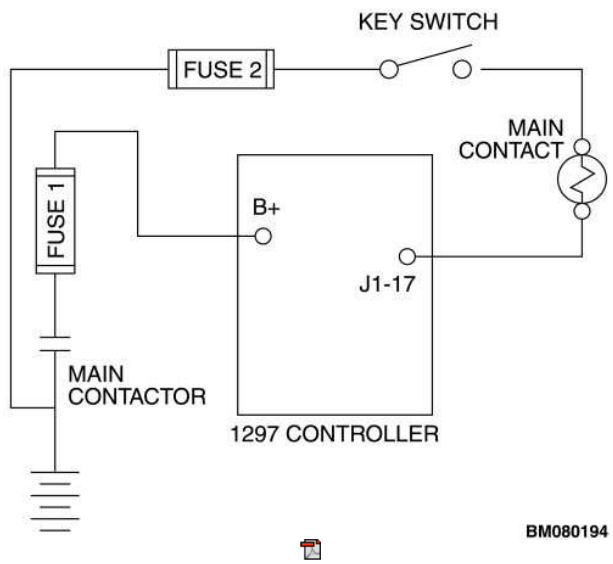
LED Code	Dash Display	Model	Programmer Display
3,3	Code 33	All	Field Short

Condition	Circuit Description
Traction motor field windings are shorted. **Truck Response** No Traction **Possible Causes and Test Procedures** **1.** Check field windings at traction motor for shorted condition. **2.** Check for continuity between the FU 1 or FU 2 terminal and the motor frame. Refer to the section **Electrical System** 2200 YRM 1052 or **Electrical System** 2200 YRM 929, Fuses. There should be no continuity. If continuity is measured, replace traction motor.	
	Logic The controller checks for resistance in the field windings of the motor. If no resistance is seen, the controller will fault.

LED Code	Dash Display	Model	Programmer Display
3,3	Code 33	All	Field Open

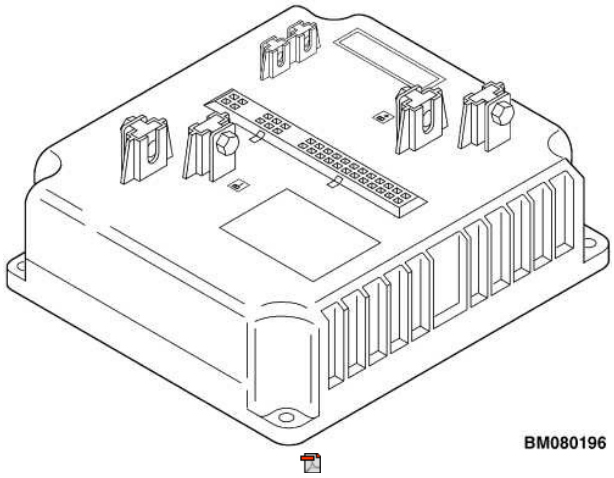
Condition	Circuit Description
The traction motor field coil circuit is open. **Truck Response** No Traction **Possible Causes and Test Procedures** **1.** Ensure wiring connections are secure. **2.** Remove wires from the FU 1 and FU 2 terminals and measure resistance between FU 1 and FU 2. Refer to the section **Electrical System** 2200 YRM 1052 or **Electrical System** 2200 YRM 929, Fuses. If high resistance is measured, replace traction motor.	
	Logic The controller checks for resistance in the traction motor field coil circuit. If no resistance is seen, the controller will fault.

LED Code	Dash Display	Model	Programmer Display
3,4	Code 34	All	Missing Contactor

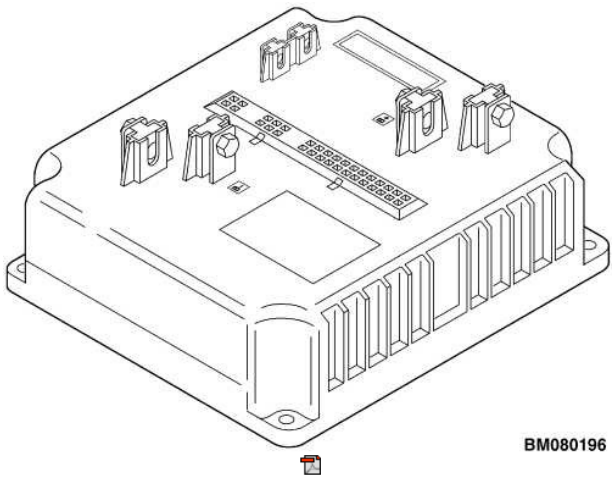
Condition	Circuit Description
Missing main contactor. **Truck Response** No Operation **Possible Causes and Test Procedures** **1.** Ensure all wiring connections to the main contactor are secure and tight. **2.** Check FU 2. Refer to the section **Electrical System** 2200 YRM 1052 or **Electrical System** 2200 YRM 929, Fuses. **3.** Check the main contactor coil. Refer to the section **Electrical System** 2200 YRM 1052 or **Electrical System** 2200 YRM 929, Repairs. Check coil resistance. MPW065E = Approx. 14 ohms	

All other models = Approx. 54 ohms **4.** Check coil open or shorted. Replace coil.	**Logic** The controller checks to ensure the main contactor circuit is completed on startup. If the controller senses this circuit has not been completed, the controller will fault.

LED Code	Dash Display	Model	Programmer Display
4,2	Code 42	All	Overvoltage

Condition Controller is sensing voltage above present value. **Truck Response** Reduced Traction Performance **Possible Causes and Test Procedures** **1.** Operating with charger attached. **2.** Incorrect battery installed in truck. **3.** Check condition of battery and battery cables. **NOTE:** When truck is subjected to high regenerative braking currents, the fault may appear as an intermittent fault and can be cleared by resetting the key.	**Circuit Description**  BM080196 **Logic** The controller monitors input voltage. When input voltage is above the controller preset, current to the traction motor is reduced.

LED Code	Dash Display	Model	Programmer Display
4,2	Code 42	All	Low Battery Voltage

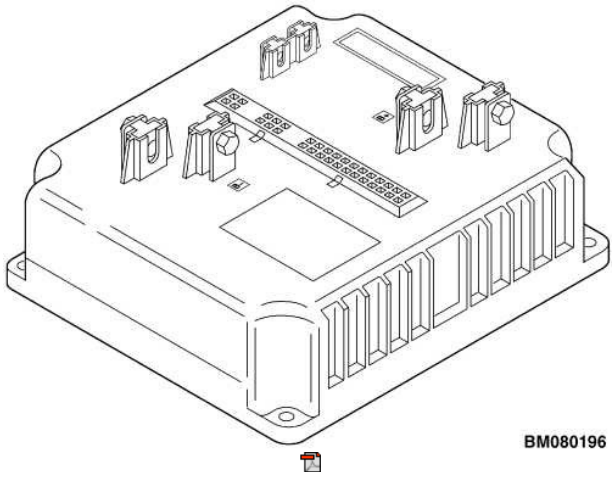
Condition Controller is sensing battery voltage below a preset level. **Truck Response** Reduced Traction Performance **Possible Causes and Test Procedures** **1.** Battery needs charging. **2.** Check battery cables for loose or corroded terminals. **3.** Incorrect battery installed.	**Circuit Description**  BM080196 **Logic** The controller monitors input voltage. When input voltage is below the controller preset, current to the traction motor is reduced.

LED Code	Dash Display	Model	Programmer Display
4,3	Code 43	All	Over Temp Cutback

Condition Controller heat sink is too hot. **Truck Response** Reduced Traction Performance **Possible Causes and**	**Circuit Description**

Test Procedures

1. Operating in a high-temperature environment.
2. Exceeding normal truck duty cycle.
   Reduce load size.
   Increase cycle time.
3. Verify correct operation of heat sink sensor.
   Use handheld programmer to check that heat sink reading is approximately room temperature after truck has cooled to room temperature.



Logic
The controller will reduce current to the traction motor when the controller exceeds 85°C (185°F). When controller cools below this level, normal traction performance will return.

LED Code	Dash Display	Model	Programmer Display
4,3	Code 43	All	Under Temp Cutback

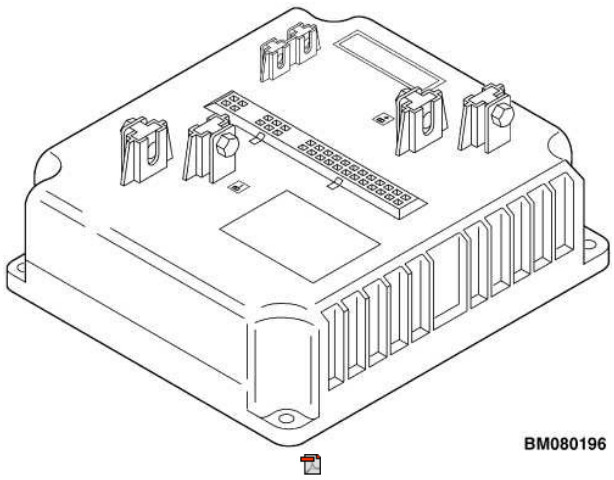
Condition
Controller heat sink is too cold.

Truck Response
Reduced Traction Performance

Possible Causes and Test Procedures

1. Operation in a cold temperature environment.
2. Verify correct operation of heat sink sensor.
   Use handheld programmer to check that heat sink reading is approximately room temperature after truck has cooled to room temperature.

Circuit Description



Logic
The controller will reduce current to the traction motor when the controller is below −25°C (−13°F). When controller warms above this level, normal traction performance will return.

Control Card Functional Test

Refer to Figure 22 for the following procedures.

1. Follow all safety precautions as listed at the beginning of this section prior to performing any electrical checks.
2. Ensure Battery is fully charged.
   a. Verify continuity between battery negative (at battery) and –B terminal (at controller).
3. Check for loose connections or damaged wiring between control card and controller.
   a. Verify connection at the controller.
   b. Very wire harness connection at the base of the steer handle.
4. Connect Curtis 1307 handset and go to tester function. Refer to 1307 Programmer Handset in this section.
   a. Look for battery voltage to be 25V approximately. If not, verify battery and connections.
   b. Check for throttle accelerator output to be 95% or more at full throttle and to be at 0% at neutral position. If not, go to Step 6.
   c. Check for lift switch, fork low switch, belly switch, neutral switch (if is a legacy card version), and horn switch input to alternate between on and off when switch is pressed and released. If not, go to Step 6.

d. If the above tests pass, the tiller head and the control card are good.

5. If handset does not operate, follow LED OFF instructions listed in LED Fault Codes.

6. If handset tests did not pass, open tiller head and verify connection at control card.

a. Power off the forklift and measure continuity between pin 2, on JP2, on the control card and B- at the controller. If an open or high resistance is measured, trace problem source and refer to troubleshooting guide.

b. Power off the forklift and measure continuity between pin 1, on JP2, on the control card and B+ at the controller. If an open or high resistance is measured, trace problem source and refer to troubleshooting guide.

c. Power on the forklift and check for 7- segment LED to light on

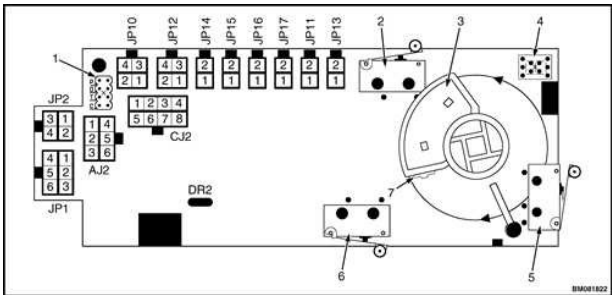
(1) If the LED is not lit then check power on JP2, between pin 1 and pin 2. JP2 voltage reading shall be 14V or more, if not, then the tiller card is not receiving power from controller. Disconnect the connection at JP1 and verify the voltage between harness pins 1 and 2 is more than 12V. Check the wiring between the controller and the tiller card, as well as the controller output. Reconnect and measure voltage on JP2 again. If voltage reading is achieved on JP2, and the 7 segment display is not lit, replace the tiller card. Refer to **Electrical System** 2200 YRM 929.

(2) Ensure jumper on SV2 is not on Diagnose, Teach or Configuration mode. SV2 jumper can be either seated on parking position (P) or not present at all. If jumper is on Diagnose, Teach or Configuration; proceed to reconfigure card through teach mode following auto-learning procedure. Refer to **Electrical System** 2200 YRM 929.

(3) Ensure 7 segment LED to display the proper control handle card setting. The configuration setting used with CURTIS controllers would be a number 7. If not, proceed to reconfigure card through teach mode following auto-learning procedure. Refer to **Electrical System** 2200 YRM 929.

d. If ON-OFF lift/lower switches did not function as expected, swap the On-Off switch with other On-Off switch available within tiller head to verify if problem follows the switch.

7. Replace the control handle card if necessary. Refer to the section **Electrical System** 2200 YRM 929, Control Handle for control handle card installation and calibration procedures.



NOTE: ENSURE THAT THE CAM MAGNETIC HOLDER IS ALIGNED WITH THE ALIGNMENT WINDOW; OTHERWISE TRACTION FUNCTIONS WILL NOT OPERATE IN ONE OF THE DIRECTIONS.

1. JUMPER TERMINALS (SV2)
2. HORN SWITCH (S1)
3. THUMBWHEEL SWITCH (CAM MAGNETIC HOLDER)
4. LED DISPLAY SCREEN
5. BELLY SWITCH (S)
6. TURTLE SWITCH (S2)
7. ALIGNMENT WINDOW (CAM MAGNETIC HOLDER)

Figure 22. Control Card

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